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ABSTRACT

The UNESCO International Environmental Education Programme has undertaken a comparative study of the incorporation of environmental education into elementary and secondary school curricula. A survey was designed to investigate how environmental education has been introduced into school curricula in different educational systems in various countries. This document presents environmental education in terms of its goals, objectives, and guiding principles, as formulated at the International Workshop on Environmental Education, held at Belgrade, Yugoslavia, in 1975, and the International Conference on Environmental Education, held at Tbilisi, Russia, in 1977. Survey responses are included from the nations of Colombia, West Germany, India, Jamaica, Japan, Kenya, Kuwait, Malaysia, Nepal, Sri Lanka, Thailand, Russia, and Venezuela. These responses included: (1) national policy on environment and environmental education; (2) environmental education curriculum, including aims, objectives, content, teaching methodologies, and examples of learning activities; (3) evaluation; and (4) teacher education. The responses are synthesized and trends and problems are described. A bibliography is included. (TW)

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Unesco-UNEP International Environmental Education Programme

Environmental Educational Series **17**

A Comparative Survey of the Incorporation of Environmental Education into School Curricula

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PREFACE

The Unesco-UNEP International Environmental Education Programme has undertaken a Comparative Survey of the Incorporation of Environmental Education into School Curricula to find out, in a few countries of each world region, how environmental education has been introduced into school curriculum in the context of different educational systems. The Survey and its conclusions are reproduced in the present document for dissemination to professionals and institutions for furthering the exchange of information and experience in the development of curriculum in environmental education.

The Survey presents environmental education, its goals, objectives and guiding principles as formulated at the International Workshop on Environmental Education, Belgrade, 1975, and the Intergovernmental Conference on Environmental Education, Tbilisi, USSR, 1977. The Survey covers 13 countries in Asia, Latin America and the Caribbean, Africa, the Arab States and Europe. Environmental education elements that the Survey has dealt with in the context of the curriculum of each Member States are: (a) national policy on environment and environmental education; (b) curriculum for environmental education, aims and objectives, content, teaching methodology, examples of learning sequences, etc.; (c) evaluation; and (d) teacher education. The Survey combines the experiences of the 13 Member States in concluding certain trends in the incorporation of environmental education into school curricula.

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CONTENTS

1. Introduction

2. Terminology: What is Environmental Education?

3. Environmental Education Programmes in Some Selected Countries
   - 3.1 Colombia
   - 3.2 Federal Republic of Germany
   - 3.3 India
   - 3.4 Jamaica
   - 3.5 Japan
   - 3.6 Kenya
   - 3.7 Kuwait
   - 3.8 Malaysia
   - 3.9 Nepal
   - 3.10 Sri Lanka
   - 3.11 Thailand
   - 3.12 Union of Soviet Socialist Republics
   - 3.13 Venezuela

4. Survey of Environmental Education Trends
   - 4.1 National Policy on the Environment and Environmental Education
   - 4.2 The Environmental Education Curriculum
     - Primary School Level
     - Secondary School Level
     - Environmental Studies as a Special Subject
     - Infusion of Environmental Education Concepts into Existing Subjects
     - Special Units of Environmental Studies in the Existing Subjects
   - 4.3 Evaluation
   - 4.4 Teacher Education

5. Some Problems and Issues in Environmental Education

References

Appendices

1. INTRODUCTION

Environmental problems at the global, national and local levels were escalating at such a rapid rate during the last few decades that they have emerged as a major concern of the international community, particularly of educational planners and curriculum developers. The rise of environmental education as one of the priority areas of educational innovation seems to be based on three phenomena:

- an increasing awareness of the crucial role which a sound environment would play for the survival and further development of mankind
- a restructuring of scientific inquiry away from 'disciplines' and towards a total systems approach regarding a given situation
- a trend of modernizing curricula in formal and non-formal education to make them more relevant to current problems and to ensure a high degree of active learner participation in dealing with these problems.

A survey of the literature in this field indicates that although environmental education, as such, is of relatively recent origin in many countries around the world, there is considerable interest shown not only in the identification of substantive teaching/learning materials but also in possible strategies for implementation in formal and non-formal educational systems. It is evident that there has always been some awareness of the value of the environment and the need for its conservation and protection in the traditional value systems of most cultures, where the people considered themselves as a part of the natural environment whose proper management and well-being was essential for their existence and further development. This healthy attitude towards the environment that existed in traditional societies unfortunately began to decline gradually with the advancement of industrialization and urbanization coupled with the changing values associated with modern consumption oriented life styles.

A new interest in environmental matters and an awareness for its well-being began to develop gradually during the last decade, as a result of both the global concern for the environment and the deterioration of the environmental situation locally. The concern for environmental education as a distinct entity became evident in the early seventies, and therefore the seventies may be referred to as the Decade of Environmental Education. During this period several countries had started making their own efforts to incorporate elements of environmental education to their education systems. In addition to these individual actions at national level, efforts were being made to strengthen these activities under the auspices of the United Nations. One important outcome of such efforts was the first United Nations Conference on the Human Environment (Stockholm, June 1972) organized by the UN which highlighted the need to develop an environmental education programme at international level. One of the recommendations of this conference led to the establishment of the United Nations Environment Programme (UNEP) while other recommendations laid the foundation and framework for a co-operative effort in a programme of environmental education at international level[1]. One major action in this context was the launching of the Unesco-UNEP International Environmental Education Programme (IEEP) which organized the International Workshop on Environmental Education, Belgrade, 1975. A statement adopted at this workshop which provided the framework and guiding principles for global environmental education came to be known as the Belgrade Charter[2].
This charter recognized the urgent need in environmental education to develop a global understanding or perspective of the ecological, economic and moral considerations. Parts B, C and D of the charter specifying the goals and objectives of environmental education are as follows:

B. Environmental Goal

The goal of environmental action is:

To improve all ecological relationships, including the relationship of humanity with nature and people with each other.

There are, thus, two preliminary objectives:

1. For each nation, according to its culture, to clarify for itself the meaning of such basic concepts as "quality of life" and "human happiness" in the context of the total environment, with an extension of the clarification and appreciation to other cultures, beyond one's own national boundaries.

2. To identify which actions will ensure the preservation and improvement of humanity's potentials and develop social and individual well-being in harmony with the biophysical and man-made environment.

C. Environmental Education Goal

The goal of environmental education is:

To develop a world population that is aware of, and concerned about, the environment and its associated problems, and which has the knowledge, skills, attitudes, motivations and commmitment to work individually and collectively toward solutions of current problems and the prevention of new ones.

D. Environmental Education Objectives

The objectives of environmental education are:

1. Awareness: to help individuals and social groups acquire an awareness of and sensitivity to the total environment and its allied problems.

2. Knowledge: to help individuals and social groups acquire basic understanding of the total environment, its associated problems and humanity's critically responsible presence and role in it.

3. Attitude: to help individuals and social groups acquire social values, strong feelings of concern for the environment and the motivation for actively participating in its protection and improvement.

4. Skills: to help individuals and social groups acquire the skills for solving environmental problems.

5. Evaluation ability: to help individuals and social groups evaluate environmental measures and education programmes in terms of ecological, political, economic, social, aesthetic and educational factors.

6. Participation: to help individuals and social groups develop a sense of responsibility and urgency regarding environmental problems to ensure appropriate action to solve those problems.

The Belgrade workshop catalysed similar activities at the regional and national levels in different parts of the world. The Belgrade recommendations were reviewed and evaluated in the context of the situations in different regions and nations at various workshops paving the way for the Inter-Government Conference on Environmental Education held in Tbilisi, USSR in October 1977. This conference, which was organized by Unesco in co-operation with UNEP arrived at recommendations for actions which might be undertaken at the national, regional and international levels. Of the 41 recommendations formulated by the conference, 16 were on strategies for the development of environmental education at the national level. The Declaration and Recommendations of the Conference, considered to be the most important single document on environmental education, outlined a substantive structure, policies and strategies for environmental education and stated the following goals, objectives and guiding principles[3]:

1. The goals of environmental education are:

   a) to foster clear awareness of and concern about, economic social, political and ecological interdependence in urban and rural areas;

   b) to provide every person with opportunities to acquire the knowledge, values, attitudes, commitment and skills needed to protect and improve the environment;

   c) to create new patterns of behaviour of individuals, groups and society as whole towards the environment.

2. The categories of environmental education objectives:

   Awareness: to help social groups and individuals acquire an awareness of and sensitivity to the total environment and its allied problems.

   Knowledge: to help social groups and individuals gain a variety of experience in, and acquire a basic understanding of the environment and its associate problems.

Attitudes: to help social groups and individuals acquire a set of values and feelings of concern for the environment, and the motivation for actively participating in environmental improvement and protection.

Skills: to help social groups and individuals acquire the skills for identifying and solving environmental problems.

Participation: to provide social groups and individuals with an opportunity to be actively involved at all levels in working towards resolution of environmental problems.

3. Some guiding principles for environmental education:

Environmental education should:

- consider the environment in its totality - natural and built, technological and social (economic, political, technological, cultural-historical, moral, aesthetic);

- be a continuous lifelong process, beginning at the pre-school level and continuing through all formal and non-formal stages;

- be interdisciplinary in its approach, drawing on the specific content of each discipline in making possible a holistic and balanced perspective;

- examine major environmental issues from local, national, regional and international points of view so that students receive insights into environmental conditions in other geographical areas;

- focus on current and potential environmental situations, while taking into account the historical perspective;

- promote the value and necessity of local, national and international co-operation in the prevention and solution of environmental problems;

- explicitly consider environmental aspects in plans for development and growth;

- enable learners to have a role in planning their learning experiences and provide an opportunity for making decisions and accepting their consequences;

- relate environmental sensitivity, knowledge problem-solving skills and values clarification to every age, but with special emphasis on environmental sensitivity to the learner's own community in early years;

- help learners discover the symptoms and real cause of environmental problems;

- emphasize the complexity of environmental problems and thus the need to develop critical thinking and problem-solving skills;

- utilize diverse learning environments and a broad array of educational approaches to teaching/learning about and from the environment with due stress on practical activities and first-hand experience.

2. TERMINOLOGY: WHAT IS ENVIRONMENTAL EDUCATION?

The 'environment' is considered to be the "world around man" or "that sector of the outside world which has direct impact on man". The concept of the environment is now being extended to include not only the bio-physical natural environment, but also the man-made physical environment as well as the political, economic, cultural, technological, social and aesthetic environment. It is in fact the aggregate of external conditions - physical, biological, social and cultural - that influence life on this planet. The environment is conceived of not as a static system but as a dynamic system in which the sub-systems are in constant interaction with each other and undergoing continuous change.

Though the term 'environment education' as a distinct entity, is of recent origin, the environment had been associated with and had been a source of education from the very early days of human civilization. To grasp the intricate interactions and interrelationships in man's environment, the science of 'ecology' evolved. Originally this term was used in biology in the restricted sense of the study of a plant and its environment before it came to describe the totality of complex interdependencies in an environment. Ecology as the science of man and his environment was mainly used to detect problems in the outside world before one came to realize that basically man himself was the cause of these problems. Only through 'disorder' in man's inner world could he create a "disorderly outside world". The focus of attention moved from the created problems to their creator and Human Ecology emerged as a science concerned with the interdependencies in man's inner world.

Long before the term 'environmental education' came into common usage in the seventies, the roots of environmental education could be traced back to school curricula where certain elements of the environmental education

concept existed in school subjects under various names, e.g., Nature Study, Rural Science, Conservation Education, Field Studies, Geography, Biology, etc. However, these curricula were concerned only with two dimensions related to the environment, viz. learning from or through the environment and learning about the environment. A vital third dimension, education for the environment, was missing. Moreover, the methodology of teaching these subjects was limited to the impartation of factual knowledge about the environment; the content was not based on real life problems; the problem-solving approach was not evident; and an interdisciplinary approach to environmental problems was lacking.

The situation began to change in the seventies, when in response to ecological considerations highlighted primarily by conservationists, school curricula became more and more concerned with environmental problems. Consequently, the third dimension - education for the environment became gradually incorporated into the school curriculum through some of the traditional school subjects such as Science, Geography and Nature Study. This led to the evolution of the concept of environmental education as a definite entity, giving it a wider interpretation where in addition to the mere acquisition of knowledge (cognitive domain), skills and attitudes (psycho-motor and affective domains) related to environmental problems were also incorporated. It was felt further that emphasis should be paid to the development of moral values so as to enable one to assume personal responsibilities for the consequence of ones actions and be committed to improve the environment. This concept has been referred to as the development of an 'environmental ethic'.

A more extensive definition evolved in the seventies in the light of the broader definition given to the term environment to include, in addition to the concern for the natural environment, the consideration of all aspects of the social environment as well as the man-made environment and the

interaction between man and the environment in its totality. Environmental education has been described as "the result of the re-orientation and dovetailing of different disciplines and educational experiences which facilitate an integrated perception of the problems of the environment, enabling more rational actions to be taken, which are capable of meeting social needs"[4].

The following definition, out of several found in the literature, seems to present a rough approximation of the interpretation given by many countries to environmental education:

> Environmental education is the process of recognizing values and clarifying concepts in order to develop skills and attitudes necessary to understand and appreciate the interrelatedness among man, his culture and his biophysical surroundings. Environmental education also entails practice in decision-making and self-formulation of a code of behaviour about issues concerning environmental quality[5]. (This definition was accepted and recommended for wide use by the International Working Meeting on Environmental Education in the School Curriculum, organized by the IUCN Commission of Education under the sponsorship of Unesco, 1970).

3. ENVIRONMENTAL EDUCATION PROGRAMMES IN SOME SELECTED COUNTRIES

An attempt was made in this study to collect, analyse and compare environmental educational material from several countries. It was found that some countries have not yet included any material relevant to environmental education in their school curricula. Information extracted from materials available from thirteen countries are presented in this chapter. This material was gathered from sources such as: school syllabuses of instruction, textbooks, teachers guides, supplementary reading materials, teacher education courses and published reports. In the case of some countries, it was possible to obtain fairly comprehensive information covering several aspects of environmental education such as:

- National policy on environment and environmental education
- Curriculum for environmental education, aims and objectives, content, teaching methodology, examples of learning sequences, etc. ,
- Evaluation
- Teacher education
- Problems and issues

But, the information available from some countries was rather limited. Therefore some of the following reports from the selected countries will cover all the areas mentioned above, whereas some will cover only a few of them.

The following countries are included in the study:

1. Colombia
2. Federal Republic of Germany
3. India
4. Jamaica
5. Japan
6. Kenya
7. Kuwait
8. Malaysia
9. Nepal
10. Sri Lanka
11. Thailand
12. Union of Soviet Socialist Republics
13. Venezuela

3.1 Colombia

Behind current programmes and activities for the development of environmental education in Colombia is an established environment policy which includes a National Development Plan, an ecological code and a series of educational reform decrees of the Ministry of Education. The Plan is directly concerned with the environmental impact of development measures: the code has led to the creation of a Commission dealing with the evaluation and effective application of environmental education. The Ministry of Education itself had undertaken an educational reform which has meant incorporating environmental education principles that have found agreement at international conferences. These involve goals, objectives, content and materials as well as ways and means of introducing the environment dimension into the educational system.

3.1.1 National policy on the environment and environmental education

Following the world trends of concern for the environment and conscious of the national environment problems, during the last decade the successive governments have shown much concern for the environment and the need for environmental education in their development plans for the country. Provision is made for:

- a policy for rural and urban development;
- programmes for the integration of services and community participation to solve problems in urban marginal areas;
- programmes of health and environmental sanitation;
- plans for the development of the national territories.

They also establish the need for co-ordination with the educational policy in the fields of health and nutrition, population education and other aspects related to the environment.

Due to the imminent need of protection and development of the natural renewable resources the Colombia government created by Decree-Law 2420 of

1968 the National Institute for the Development Natural Resources (INDERENA) and made it responsible for the regulation, administration, conservation and fostering of the natural renewable resources of the country in relation with fishing in rivers and sea, soil, forests, fauna, flora, hydrographic basins, underground and shallow waters, natural reserves, national parks, communal savannahs and national prairies.

In 1974, Decree-Law 2811, known as the code of Natural Renewable Resources and of Environmental Protection, established a very well defined environmental national policy. The necessary elements for the development of a global strategy for protection and conservation of the environment are given in it. In addition, the Code regulates the management of the natural resources and orders:

a) the inclusion of courses on ecology, environmental preservation and natural resources in all the levels of the educational system of the country,

b) the fostering of interdisciplinary studies on the environment, and

c) the promotion of the celebration of "environmental days" with community participation.

It also creates a compulsory Natural Environment Service that the students must accomplish in secondary school.

Policy on Environmental Education

For the regulation of environmental education, Decree 1337 of 1978 created a national consulting Commission for Ecology and Environmental Education whose members are representatives of the Ministries of Education and Agriculture.

The functions of this commission are:

- Identify and recommend, for their inclusion in the different levels of the formal educational system, the principles that should enable the pupil to reconstruct natural and social processes and their interrelationships, based on the immediate reality; also the relationships of man with his environment and the possibilities of attaining better ways of

exploitation and management of natural resources through community organizations, to be included in the social sciences programmes.

- Give advise for the preparation of textbooks and other educational aids for environmental and ecological education.

- Identify and recommend for their inclusion in Teacher Training Programmes the appropriate contents in order to motivate, inform and enable the future teacher to manage in an appropriate way the ecological and environmental aspects of the curriculum.

In addition, Decree 1337 of 1978 establishes that:

- the schools should co-operate in community activities related to the study of the natural resources of the community collecting and reporting information in order to attain their better utilization;

- the communities should participate in "environmental day" activities for the identification of particular environmental problems and the search and application of solutions. Students should actually participate in these "environmental days";

- the natural Environmental Service established by Decree-Law 2811 of 1974 should aim at the training of future citizens in the knowledge and solution of problems related to environmental protection and the adequate management of the natural renewable resources. It would be one of the options of the Social Service that all students must accomplish before they finish secondary school (Dc. 20 59/62) and will have a duration of 22 hours for theoretical preparation and 50 hours of practice in existing programmes in institutions related to the programmes in the area of ecology;

- the ecological component in the four years of basic secondary education should analyse the ecological problems and establish their incidence on the processes of development in the balance of ecosystems;

- the ecological component in the two years of vocational intermediate education should focus on the environmental problems and those of conservation and recuperation of natural resources in the context of the vocational option chosen by the student. (The options include Humanities, Sciences, Technology);

- the evaluation of the impact on the community of the programmes of environmental and ecological education should be organised by the Ministry of Education and the Institute for the Development of Natural Resources (INDERENA).

Most of the environmental education programmes in Colombia are being developed by the non-formal and informal systems of education, through the

initiative of governmental and non-governmental agencies concerned with the problems of the environment.

3.1.2 Curriculum for environmental education

In considering the environmental education curriculum in the Colombian schools, one has to examine two systems - the traditional formal educational system and the new system.

The traditional system consists of:

- Primary Education (grades 1 - 5)
- Medium Education (grades 1 - 6, Bachellecato)
- Higher Education

The new system consists of:

- Pre-school (grades A & B)
- Basic Education
  - Primary (grades 1-5)
  - Secondary (grades 6-9)
- Middle Vocational Education (grades 10-11)
- Intermediate Vocational Education (2 years).
- Higher Education

The new curriculum has not yet replaced the traditional one, and therefore both are considered in this study.

The Traditional Curriculum

The traditional programmes have considered aspects related to environmental education on a multidisciplinary basis, mainly in the areas of natural sciences and social studies. General objectives and contents (for each grade) relevant to environmental education are given below.

Primary Education (Programmes of 1963)

a. *Natural sciences*

General Objectives

- To enable the child to utilize natural resources in all aspects of the natural economic activities: agriculture, cattle raising, mining, industries.

- To develop a spirit of observation, inquiry and experimentation in such a way that the learner would be able to analyse, compare and deduce principles in order to solve problems related to survival and the transformation of the environment for a better utilization.

- To develop good habits related to nutrition and health.

- To awaken the child's interest for nature in order to know and enjoy it.

- To develop skills for the appropriate exploitation of the soil, plants, animals and other resources in the community.

Contents

1st grade

Useful and harmful animals and plants, utility of minerals and care of gardens.

2nd grade

Animals: where they live, their utility or harm to man; plants: their importance, importance of forests to prevent erosion; metals: their importance for man.

3rd grade

Water: drinking water, danger of water pollution, utility of water, sanitation.

Care and defense of domestic animals, animals that are harmful to health, animals that are harmful to agriculture.

4th grade

Food, agriculture (practices), soil. Importance of air for life. Notions about conservation of natural resources, Organization of committees "Friends of Nature". Participation in campaigns for the protection of nature.

5th grade

Individual responsibility about problems of health in the community, agriculture, care and conservation of natural resources, participation in reforestation campaigns, hygiene, sanitation.

b. *Social studies programmes (1963)*

General Objectives

- To understand and appreciate the interdependence between man and his environment.
- To understand and to adapt to social, cultural, technological and scientific changes and their consequences for the life of man.
- To know the needs and public problems and to co-operate in the efforts made to solve them.

Contents

1st grade

Water: its utility.

Security norms, observation of places of potential danger.

Norms in case of disasters.

2nd grade

Man transforms the environment and the environment transforms man.

Influence of the environment in housing, clothing, feeding and protection.

Population. Why are some areas more inhabited?

Ways for transportation.

3rd grade

How man has transformed the "Department" (this is the political and administrative division of the country).

Occupations in relation to the environment.

Population.

4th grade

Climate. Elements, factors, influence on life.

Importance of water in the economic life of the region.

Notions about main sources of wealth in the country.

5th grade

Climate. Influence on flora, fauna and human life.

Natural resources, their exploitation in Colombia.

How to improve agricultural production.

The importance of trees, campaigns.

Damage caused by burning of the land and clearing forests.

Erosion, water as a factor for industrialization, population, tourism.

Medium Education

a. *Natural sciences*

General Objectives

- To develop critical thinking as a tool for the solution of daily problems.
- To develop a responsible attitude towards the conservation and improvement of natural resources.
- To appreciate and promote the practical value of science in:
  - . agriculture
  - . the improvement of physical and human conditions at home, the community and the nation
  - . the control of natural phenomena.

Some examples of contents for 1st and 4th year from the official programmes are the following:

1st year:	Water, biological cycle	4th year:	Ecology
	Pollution		Species and the environment
	Danger of pollution of rivers and seas		Different environments in the biosphere
	Transportation of polluting substances		Ecological balance

b. *Social studies*

General Objectives

- To guide the student in the application of his own potential for his own benefit, the benefit of other people and of the priorities of development of the country.

- To develop attitudes of co-operation and responsibility towards the solution of problems in the family, school, work, community and in the national and international levels.

General Objectives in Geography

- To know the natural resources from which man can benefit.

- To acquire the necessary skills for observation and inquiry about the geographical reality and about ways to discover and interpret it.

Contents

1st year

The geographical landscape.

The value of natural resources, man's action to modify and conserve the environment when exploiting the natural resources.

Relief and climate, influences.

Erosion, examples in Colombia.

Water streams in Colombia.

Population: distribution in the world and in Colombia.

Migrations, demographic explosion. Problems in Colombia (health, education).

Man and his environment. Interaction. Technological advances for better adaptation and transformation. Changes in ways of life.

Influence of relief and climate in economic activities and transportation. Different types of housing depending on climate and the natural environment. Some problems of the Colombian economy. Need for the conservation of natural resources in face of the energy crisis.

2nd year

Population in Latin America.

Present social and economic problems in Latin America (demographic explosion, migration to urban areas, underdevelopment).

3rd year

Demography in Colombia.

Consequences of demographic explosion.

Family planning.

Problems of rapid urbanization.

Underpopulation in rural areas.

Economy. Agriculture

Cattle raising
Mining
Industries
Commerce
Forests: exploitation, erosion.

c. *Special programmes on ecology or environmental education*

By their own initiative some Secretariats of Education in different Departments have established special courses related to environmental education as separate subjects in Medium Education. A selected example is the initiative of the Department of Cundinamarca, which established by Decree 1237 of 1978 a technical subject called "Conservation of Natural Resources" to be imparted in all years of Medium Education (1st - 6th Bachellecato) in all schools of Cundinamarca. In 1983, Decree 234 of the Ministry of Education created a special subject to be imparted only during the second semester of 1983, to all students in primary and medium education. It is called "Cátedra de Mutes" (15 hours during the second semester of the school year). This special course was introduced in order to celebrate the 200 anniversary of the "Botanic Expedition" carried out by José Celestino Mutis in 1783, which produced new knowledge about the Nuevo Reino de Guareda (Colombia) in relation with its natural and cultural environment and contributed to the confrontation between the Hispanic culture and its "creole" version in America. Some of the general aims of this special course are directly related to environmental education:

- To analyze through practical activities, the influence of the existent relations between man as a social being and his natural environment, and the transformation of the environment and the society through scientific and technological advance.

- To apply knowledge, using a scientific methodology in the solution of environmental problems which result from the misuse and unscientific exploitation of the natural resources.

- To foster positive attitudes towards the conservation of natural resources as factors for ecological balance and for the social and economic development of the country.

Some examples of the contents related to environmental education are given below (only the more relevant topics are mentioned).

Contents (Primary Education)

1st grade

Some characteristics of the tropical environment in America.

Major observations of José Celestino Mutis on the South American environment.

Classification of living and non-living beings according to certain features.

Characteristics of the living beings in relation to their environment. Differentiation according to their environment.

Natural regions in Colombia.

Man uses culture to transform the environment.

Food chains between the living beings in a particular environment. Relationships.

Studies about plants made by the "Botanic Expedition"

Educational campaign to favour the life of plants and animals.

Importance of the conservation of the environment.

Consequences of soil, water and air pollution by garbage.

2nd and 3rd grades

Comparison of different natural environments.

Natural renewable resources.

Reproduction of the basic steps of the scientific method employed by the team of the Botanic Expedition.

Educational campaign for the promotion of growing plants and its importance.

Educational campaign for preservation of the environment.

4th and 5th grades

Climatic factors that influence the characteristics of the living beings in the region.

Analysis of environmental problems through a scientific methodology.

Solution of environmental problems through a scientific methodology.

Causes and consequences of misuse of natural resources.

Principal problems in the region due to it.

Educational campaigns for preventing environmental pollution.

Consequences of pollution in the deterioration of flora and fauna and for man's health.

Medium Education

Principal characteristics of the tropical environment.

Principal characteristics of the biomass studied by J C Mutis.

Principal characteristics of the biomass of the region (where the pupil lives).

Diversity of tropical fauna and flora as a result of the influence of the environment and the evolution of species.

Interaction between organisms and with the environment where they develop. (adaptations, eco-systems).

Trophic chains, energy chains.

Man as a part of an eco-system.

Observation and description of organisms and their relationships with their environments.

Ecological problems as a consequence of the natural imbalance.

Preservation of natural resources.

Some environmental problems of the region.

Causes and consequences of the destruction of natural resources, according to the detected problems.

Possible practical solutions for the ecological problems.

Influence of man on the environment for improving, conserving or preserving it and the negative influence due to a misuse of natural resources.

Organization of a reforestation campaign (to be carried out with the community).

4th, 5th, 6th year

Current knowledge in ecology for the

- rational use of natural resources
- analysis of environmental problems
- political solution of environmental problems

As a general comment it can be said that when special programmes are prepared for ecology or environmental education courses the contents necessarily overlap with those of the areas that have traditionally given information and fostered the acquisition of attitudes and values related to environmental issues. Their advantage, on the other hand, is that special attention is drawn over the environmental problems and special concern of the whole school and even the whole community can be gained during some time even for the search and application of alternative solutions to real problems that might otherwise be not attended to.

The New Curriculum

Among the aims of education stated in the new curriculum, four relate to environmental education:

- To foster in the person the spirit of protection, conservation, recuperation and rational utilization of the natural resources and of the goods and services of society.
- To develop in the person a critical and analytical capability of the principles and methods of each of the areas of knowledge in order to be able to participate in the search for alternative solutions to the national problems.
- To contribute to the balanced development of the individual and society founded in respect for life and human rights.
- To contribute to the development of a responsible citizen in moral and civic aspects.

The new curriculum is conceived to be pupil centred and to maintain balance between theoretical conceptualization and practical application. These characteristics allow the integration of environmental issues to the

contents and activities suggested in the new curriculum programmes based on the understanding of the immediate natural and social reality.

The curriculum reform, not only introduces changes in the theoretical approach presented for the different areas of study and up-dates the contents but also fosters a new methodological approach which stimulates the active participation of the student in the learning process. More than the acquisition of knowledge by repetition it pursues the formation of attitudes and values and the acquisition of the necessary skills and processes for the search of knowledge and its interpretation.

Except for pre-school education, where a special content area on environmental education has been developed, the concepts, attitudes and values related to environmental education are introduced in the new curriculum through a multidisciplinary approach. They are considered in the programmes of the area of natural sciences and health which give scientific information on biology, physics and chemistry and encourage practical application of the scientific method for the study of natural and of hygienic habits, and in the area of Social Sciences for the study of geographical, socio-economic and moral and civic aspects related to environmental education. But the aim of integration, especially in primary education, allows the use of environmental issues as the axis of integrated units to which the different areas contribute, in an interdisciplinary form, including language, mathematics, aesthetic education and even religion. This integrated, interdisciplinary effort is left to the teacher's creativity when adapting the national curriculum to the local conditions, taking into account the particular needs and interests of the students and the characteristics, needs and possibilities of the local situation.

The new curriculum is still in a formative process. Therefore, the contents and/or objectives of different areas related to environmental education of the levels in which they have already been prepared are given below:

Pre-school Education

General Objectives

- To find simple relations of interdependence between the living and non-living beings, through the exploration of the surrounding physical environment.

- To recognise the best way of satisfying basic needs in accordance with both the physical and social environment where the child lives.

- To identify some simple problems in the community as a result of the exploration of the environment.

- To infer the consequences of a destructive action and to "take the place" of the ones who suffer because of it.

- To gain awareness of the fact that his/her own actions may have consequences that may affect other persons.

- To make a decision related to an environmental problem and to act according to it.

- To get insight of some value behind his/her action in the physical and social environments.

Basic Education

a. *Natural sciences programmes (ecological approach)*

General Objectives for Basic Education

- To understand the influence of the existing interactions between man as a social being and his natural environment, contributing thus, to the transformation and conservation of the environment and the society through scientific and technological advances.

- To value the importance of the natural resources and man's influence in the maintenance of ecological balance.

General Objectives for Basic Primary Education

- To recognise the actions and effect (positive or negative) that man, as a thinking and responsible being, can exercise upon the other living beings and the rest of the environment, both in their relationships and their interdependence.

- To establish the factors and characteristics of the different levels which constitute a system and the relationships between them in a particular level of organisation of the natural world.

- To apply general principles of scientific character to analyse and explain different events which take place in daily living.

- To co-operate directly or indirectly in the conservation, improvement and control of the environmental resources.

Ecological concepts are dealt with in each grade of basic primary education according to the main unifying themes of the natural science curriculum.

b. *Health programmes*

General Objectives

- To recognise that man, as a living and rational being is formed by systems that interact between them and with the environment, maintaining a biological and social balance which results in the physical, mental, and emotional well-being, which is considered as a state of good health.

- To recognise the need of maintaining balance in nature and the influence of it in the individual's health.

General Objectives for Basic Education

- To recognise the relationship of the physical, biological and social environment in the health of the individual and the community.

- To recognise the importance of active community participation for the improvement of the physical, biological and social aspects related to health.

General Objectives for Basic Primary Education

- To understand the relationship between hygienic habits, good nourishment and a health life.

- To develop responsible and helpful attitudes towards the family and the community.

- To contribute to the organisation of the physical and social environment of the home, the school and the community in a way conducive to the conservation and fostering of individual and collective health.

- To contribute to the conservation of the natural resources of the environment.

c. *The social science curriculum*

Content related to environmental concepts are integrated in the social science curriculum in each grade of basic primary education and in the sixth

grade (or first year of secondary basic education). Some examples are given below:

Primary Level

Characteristics of the geographical landscape, natural resources, and their rational use. Comparsion of the environment of the rural areas and cities.

Transformations taking place in the environment. Relationship of the physical environment with the life of the people.

Industrialization, its effects on the life of the people and the environment.

Land and population, migration from rural to urban areas.

Secondary Level

Changes on the earth - natural and those produced by man.

The ecological dialogue.

Development and maintenance of non-renewable resources.

Natural regions in Colombia.

3.1.3 Evaluation

The environmental objectives and content are evaluated as a part of the social sciences and natural sciences when the pupils' achievements in these subjects are evaluated. Most of the evaluation activities take the form of written tests as soon as the children are able to read and write, but some teachers also include for evaluation group work, home work, interest and participation of the students in activities and projects.

If some important content related to environmental education was studied in a certain period it is likely to be included in the tests or other evaluative activities. But since most of the main objectives related to environmental education are attitudinal, they are difficult to be evaluated unless the teachers have been specially trained or are aware of the importance of the acquisition of positive attitudes towards the environment and consequently draw special attention to checking the attainments of their students

in this respect. The new curriculum proposes a new evaluation system in which special attention is given to the achievement of the specific objectives, including those related to the affective (attitudinal) domain, selected by the teacher for summative evaluation in each period. Great importance is given to formative evaluation and doing remedial work in time to improve the students performance. Also self-evaluation and evaluation on the part of peers are important components of the new evaluation system. Grades will be reported on a 1-5 points scale in all levels.

3.1.4 Teacher education

In the preparation of primary school teachers, no special course on environmental education or pedagogical approaches or methods for teaching environmental issues have been introduced in the curriculum other than what is usually found in natural and social sciences programmes.

Concerning secondary school teachers, only those who are going to be natural science teachers receive special courses on ecology; only future teachers of social science receive special courses on demography, economic development, etc.

But the in-service teacher training system has recently included some special courses on environmental education, which are planned by Secretariats of Education of the "Departments". These courses are followed by teachers if they are interested and they receive for them, as for other courses, credits for their promotion in the teachers salary scale.

The special interest of Cundinamarca's Secretariat of Education on environmental education has again been shown by the number of courses made available to both primary and secondary school teachers.

3.1.5 Future action

Some of the problems related to what could be viewed as the ineffectiveness of the type of environmental education given so far in Colombia are

really due to the wider ineffectiveness of the total formal education system to cater to the needs of the whole population of the country.

When universalization of basic education comes to be a reality, the effectiveness of the environmental education curriculum could be better judged by its influence in the concern and care of common people for the preservation and improvement of the environment. Action is being taken to make environmental education programmes one of the main concerns of non-formal education and informal education systems. Because of its real life motivations and implications, environmental education, if well conducted, is of interest to all people of all ages.

With respect to the curriculum itself, one must recognise the interdisciplinary nature of environmental education. Even if the contents are presented from a multidisciplinary approach, including them in different subjects or areas of study, the activities or projects related to environmental education should integrate knowledge from different disciplines and attitudes, values, skills related to the topics, problems and solutions. This is not difficult in primary education where in most of the schools one teacher is responsible for teaching all the curriculum areas. It has been found that more teachers trained in environmental education related topics are needed. For secondary school education, the solution would be to promote more team work of teachers of different areas of study to guarantee correlation, not overlapping of environmental education contents and to promote special projects and activities where an interdisciplinary approach to environmental education is reflected. This also demands more training for the teachers and some changes in the administrative structure of schools.

In all environmental education activities, observation of the real environment, inquiry of knowledge related to the topic and of the real needs and problems of the community, search of solutions, decision-making and

commitment on the part of the students, the teachers and the community would guarantee more effectiveness of the curriculum for environmental education.

3.1.6 Textbooks and materials for environmental education

The textbooks for natural and for social sciences include the topics related to environmental education. In most cases they have updated information and go beyond what the official programmes establish. Some departments have published official booklets that are given to children in primary education without taking into account grade differences. They are used according to the teachers initiative. Some publishing houses have published special textbooks on Ecology for primary education.

3.2 Federal Republic of Germany

Considering the fact that the Federal Republic of Germany has a school system with a federal structure, the policy on environmental education will be considered at the national level and the curriculum of one of the Länder, City State of Hamburg, will be examined.

3.2.1 National policy on environment and environmental education

The national policy of the FRG on environmental education is indicated in the following report[6]:

> As a direct follow-up to the Tbilisi Conference, a workshop was held in Munich in April 1978 to discuss promotion of environmental education in the Federal Republic of Germany and neighbouring countries. Experts from ministries, universities, schools state and private research institutes, the mass media, organizations and professional associations met to evaluate Tbilisi recommendations in the light of specific conditions and needs of the countries participating. The Munich recommendations adopted at the workshop, which deal with all aspects of environmental education, have become the framework and guidelines for its further development in the Federal Republic of Germany (FRG).
>
> In particular, the recommendations elaborated on the following aspects[7]:
>
> - establishment of a "German Foundation for the Environment";
>
> - directing the activities of the "Working Group for Environmental Questions" (which has already been established) towards environmental education;

- establishment of a permanent exchange of information among national institutions in the FRG which are concerned with environmental education;
- making environmental education a focal point of adult education;
- enlisting the co-operation of mass media in Europe in the field of environmental education (they should subscribe to the results of the Tbilisi Conference and develop media based projects);
- making the service of consultants for environmental education available through regional centres and similar institutions for the continuing education of teachers;
- developing a joint curriculum in environmental education for biology and geography (chemistry, physics, political studies and economics to be included later);
- application of an interdisciplinary approach to the development of curricula in environmental education;
- including all aspects of environmental education in the guidelines for curricula at all levels of the school system;
- allocating sufficient time for facilitating a project-oriented approach to environmental education;
- obtaining the co-operation of teachers, students and curriculum developers in natural and social sciences in the development of textbooks and instructional materials for environmental education;
- revising teacher education in subjects of relevance to environmental education to encompass a course of interdisciplinary basic education regarding this theme.

Following this workshop, the Conference of Ministers for the Environment, which is the highest Federal Government/Länder body for the co-ordination of environmental policy, set up a working party to promote, co-ordinate and monitor implementation of the Munich recommendations. Furthermore, in response to a Tbilisi recommendation calling for national centres for co-ordinating environmental education activities, the FRG set up the Unesco Liaison Office of Environmental Education as a Federal Government institution. Its function is to promote and co-ordinate all aspects of environmental education among the various institutions concerned at the national and international levels, by intensifying the exchange of information and ideas.

This involves preparing and organizing meetings, producing reports and documentation, contacting experts, supplying contributions to conferences, etc.

The school system of the FRG completely reflects the federal structure of the nation, that is, its individual states or Länder for which the Conference of the (Länder) Ministers of Education is the federal co-ordinating body. In view of this structure for school education, the recommendations of the Conference of Ministers on environmental education, titled Environment and Schools, adopted in October 1980, is of considerable importance. Firstly, it underlines the need for environmental education, then entrusts the school with the task of "awakening in young people an awareness of environmental issues, encouraging them to adopt a responsible attitude toward the environment and educating them to behave in an environmentally conscious manner both during schooling and in later life". Environmental education, because of its subject matter, is defined as cross-curricular or interdisciplinary and to be dealt with in the framework of the existing school timetable and curriculum.

A number of institutions have set out to promote environmental education giving particular attention to work in schools. Several have been in existence for quite some time, environmental education only becoming a major aspect of their work at a later date. Others have been formed specifically for the purpose of environmental education. Examples of such institutions are the Institut für die Pädagogik der Naturwissenschaften an der Universität Kiel (IPN) (Institute for Science Education at the University of Kiel), the Schulbiologiezentrum (School Biology Centre) in Hannover, the Deutsche Umweltaktion (German Action Committee for the Environment) in Krefeld and the Zentralstelle für Umwelterziehung an der Universität Essen (Centre for Environmental Education at the University of Essen).

In 1980, the Standing Conference of Ministers of Culture of the Länder of the FRG passed a new agreement on environment and education. The focus of

this agreement is on the recognition that man's relationship to his environment has become a question of survival. Through public education the students shall become aware of environmental problems, of their causes and of the regulations which have been passed to secure the protection of the environment. Furthermore, it shall be taught that economy and ecology may create conflicting points of view regarding the uses of the environment, but that a sensible compromise has to be achieved. In particular, the agreement states the following goals for environmental education in the schools of the Federal Republic of Germany:

Students shall be enabled and motivated

- to participate in the care for the environment and in environmental protection;
- to pursue a concentrated study and observation of their environment;
- to gain insight into ecological interdependencies and in the effects of ecological imbalances;
- to recognize the inter-relationship between ecological, economic and social influence factors and the necessity of a careful consideration of these aspects;
- to realize that environmental strain is an international problem and a question of survival for the whole of mankind and that care for the environment is therefore an international task.

These goals represent the consensus across the country regarding environmental education. They serve as points of orientation for curricula in environmental education in all the schools of the Federal Republic of Germany[8].

3.2.3 Curriculum for environmental education

The development of curricula for environmental education dates back to the early 70's when initiatives of the environmental programme of the Federal Government (1969-71) had resulted in a wider coverage of this theme in public education. Meanwhile, aspects of environmental education have become

recognised components of curricula in a number of subjects and the protection of the environment developed into a central area for interdisciplinary instruction.

Environmental Education in the City State of Hamburg

Since school education in the FRG is under the authority of the Länder, the City State (Land) of Hamburg is taken here as an example for the analysis of environmental education from primary through upper secondary education. The analysis is based on the curriculum guidelines (Rahmenlehrpläne) which constitute the legal basis for public education in the "Länder" of the FRG. The curriculum guidelines are passed by the Senator for Schools after a long process of development and revision in the school authority. The content areas spelt out by the guidelines are binding for the teacher. However, 20 to 30 percent of the instructional time remain to be at his disposal. Therefore, a certain freedom is given to the individual teacher and it is this portion of his time which cannot be examined here.

The curriculum guidelines (Rahmenlehrpläne) which are in current use in Hamburg were passed between 1974 and 1979. Four of the guidelines were passed in 1979, hence, at a time when environmental education was not yet given high priority. The field is therefore not treated as a separate curriculum area, but in the guidelines passed in 1976 and 1979 environmental education is found to be incorporated in other subject areas. Altogether they comprise "Sachunterricht", geography, social studies, politics, biology, chemistry, physics, industrial arts (Arbeitslehre), nature and technology (Natur und Technik) and to a certain degree, traffic education. The main thrust of environmental education is with "Sachunterricht", biology and geography.

Curriculum objectives for environmental education are usually not explicitly stated but have to be deduced from the general aims and the relevant

content areas. As an overall aim of primary education, it is stated that "the child shall experience 'concrete reality' and learn to be actively engaged in it". In the City State of Hamburg, "social learning is emphasized where all students shall be enabled to participate in a responsible manner in all spheres of social, economic and political life and shall be assisted in finding a corresponding identity"[9].

Different from the goals for the other subject areas, the goals for "Sachunterricht" in primary education demonstrate fairly close reference to environmental education. "Sachunterricht" is meant to lay the foundation for a number of subjects in lower secondary education. It is therefore subdivided into nature/biology, nature/physics, society and technology. In "Sachunterricht" students shall understand important phenomena and interdependencies of their environment and they shall learn to actively participate in shaping it. Furthermore, they shall be enabled to place individual experience into an overall perspective and to achieve a differentiated, unbiased relationship to their environment

Apart from these examples the general orientation regarding curriculum objectives will have to serve as the basis for a detailed analysis of the content areas which are related to environmental education. These content areas are stated in the curriculum guidelines for the different levels of the Hamburg school system.

Primary Education (grades 1 to 4)

In the primary school environmental education is taught as part of the subject "Sachunterricht". This subject area is meant to lay the foundation for a number of subjects in lower secondary education. It is therefore subdivided into nature/biology, nature/physics, society and technology.

In the first grade rain water is dealt with as the first environmental topic for 4 to 6 hours in nature/physics.

In the second grade public and private means of transportation are contrasted in about 4 classroom hours as part of the society section and environmental protection. Topics such as threats to the environment, the clash of divergent interests in exploiting and protecting the environment and protective measures are also given 4 hours.

In the third grade environmental protection is continued, again with a time allocation of 4 classroom hours. As a second topic the supply of drinking water and the offtake of sewage is treated in the society section. This topic is also allocated 4 hours. Similarly, drinking water, the cycle of water and environmental protection are even given a coverage of 12 to 15 hours in the nature/physics section.

Finally, in the section of nature/biology "man and his environment" with special consideration for environmental protection is listed as one of the suggested themes.

In the fourth grade only the society section is continued with environmental protection as a topic to be continued from second and third grade. The time allocation is again 4 classroom hours.

Lower Secondary Education (grades 5 and 6)

Since public education in Hamburg as in all the other Länder is still mainly based on a tripartite system of education, students after the end of four year primary education have to choose between Hauptschule (9 years), Realschule (10 years) and Gymnasium (13 years). As an alternative, Comprehensive Schools have been established in most areas, but they are still run on an experimental basis. In order to facilitate a smooth transition from one type of school to the other grades 5 and 6 in all types of schools have been declared Observation Stage (Beobachtungsstufe) and later on Orientation Stage (Orientierungsstufe). The City State of Hamburg has traditionally developed a close co-operation between Hauptschule and Realschule. No distinction is made in teacher certification and the curriculum guidelines for

both types of school have been combined in one volume and there is a high degree of correspondence in the content areas which are covered.

For the Observation Stage (grades 5 and 6) of the Hauptschule and the Realschule the emphasis of environmental education is carried by geography. Modes of co-operation in agriculture (8 to 10 hours), transportation and living in metropolitan areas (6 to 8 hours), man changes his environment (6 to 8 hours) are themes to be dealt with in these grades and other themes are suggested, such as agriculture and forestry for subsistence (4 to 6 hours), intensive care for crops in agriculture (4 to 6 hours), locating and exploiting natural resources (8 to 10 hours), people in industrial areas (4 to 6 hours).

For the Gymnasium the same range of themes is dealt with in the geography lessons in grades 5 and 6, but in addition "water" is included as a theme for physics (12 hours), including questions such as, purification of water cycle, treating refuse water and environmental protection.

In 1979 the curriculum guidelines for the Orientation Stage were passed to replace the guidelines for the Observation Stage for 1979. In these new guidelines environmental education was highly emphasized. In geography 32 classroom hours were allocated for environmental topics in grade 5 and another 20 in grade 6. A number of environmental topics were included in Biology too under the following themes:

- animals and plants which have adapted extremely well to their environment vs. the eradication of certain species (8 hours);
- man as a threat to his environment (species which have been eradicated or which are close to eradication), doves as town dwellers (each 8 hours);
- and one out of the following four themes: cave breeders need help (5 hours), seeds grow at different rates (7 hours), plant louse in the house garden (6 hours), the buzzard as a biological pest destruction agent (5 hours).

In addition, the following series of themes deals with the topic "man benefits from plants":

- plants improve the air (5 hours),
- plants give hold to the ground (2 hours),
- an example from the work of the park authority (2 hours).

In geography 14 hours have been allocated to the comprehensive theme: social groups in their effectiveness regarding the environment - man changes landscape. Finally, in education of traffic rules "rush hours" is treated as a topic.

Lower Secondary Education (grades 7 to 10)

In lower secondary education beyond grade 6 one has again to differentiate between Hauptschule and Realschule with their integrated curriculum guidelines and Gymnasium which has its own guidelines.

For Hauptschule and Realschule, geography and biology are the main subjects regarding environmental education. In grades 7 and 8 geography lessons deal with the following topics:

- climate and vegetation (7 to 8 hours),
- oil in its economic and political importance (3 to 4 hours),
- Europe in its development from an agrarian to an industrial state and its dependence on imported raw materials (7 to 9 hours),
- overpopulation, taking India as an example (8 to 10 hours),

Further suggested themes are:

- resort areas in their importance for tourism and the native population (4 to 6 hours),
- single crop economies as a threat to the environment and measures for environmental protection (3 to 4 hours),
- future sources of food from the open sea (2 to 4 hours).

In grades 9 and 10 (Hauptschule grade 9 only) this is continued with the following themes:

- weather and climate in their importance for man (8 to 10 hours),
- aims and problems of urban planning and urban renewal (8 to 10 hours),

- remodelling the environment through industry (8 to 10 hours),
- the opening up of resort areas as a suggested theme (8 to 10 hours).

In biology in grades 7 and 8 the biological equilibirum and environmental protection is discussed (10 hours) which can be expanded by topics such as garbage disposal. The other central theme is man's responsibility for his health (10 hours), exemplified through such topics as population explosion and problems of food supply, the ecology of the forest, the ecology of waterways.

In grades 9 and 10 (9 in the case of the Hauptschule) environmental education as part of biology is continued with the contribution and the function of organs in highly developed plants (10 hours).

Three further subjects contribute to environmental education in grades 7 to 10 (9 in the case of the Hauptschule). In social studies in grades 7 and 8 two environmental themes are discussed, they are: transportation in metropolitan areas (10 or 15 hours). In politics in grades 7 and 9 living and the environment of living is one of the themes (10 hours). This theme is continued in grade 9 (and 10) with the same time allocation.

Finally, grade 9 (and 10) chemistry includes the themes oil (polluting waterways through oil and oil products 6 hours) and plastics, environmental pollution, environmental protection, pollution of the air, the water and the soil (6 hours).

For grades 7 to 10 of the Gymnasium the largest number of themes from environmental education is covered in geography lessons.

Grade 7: Climate and vegetation in Europe as compared with dry zones and tropical areas (8 to 10 hours), supply of natural resources, food production and population distribution (6 hours), resort areas (5 hours), metropolitan areas and their nearby resort areas (5 hours).

Grade 8: Damage to the landscape through over-exploitation and one crop economies (the USA and the USSR; 6 to 8 hours), suggested.

Grade 9: Reasons for the overpopulation of India and approaches to a solution of the problem (10 to 12 hours).

Grade 10: Weather and climate (eco-system, environmental protection; 10 to 12 hours), changing the environment through industry (15 to 20 hours, suggested), tourism, its economic function and its effects (15 to 20 hours, suggested).

In social studies environmental topics are included under "public expenditures and decision-making" in grade 10 (25 hours). Similarly, in politics, environmental problems are suggested for a project under co-operation - showing responsibility (theme: reducing environmental strain).

In chemistry air and water are dealt with intensively in grade 8 (12 hours). In biology environmental guidelines are covered in grades 7 to 10, i.e., the ecological importance of insects in grades 7 and 8 (20 hours) and population explosion and food production (20 hours) and illness through environmental strain (15 hours, suggested) in grades 9 and 10.

Upper Secondary Education (grades 11 to 13)

In grades 11 to 13 of the Gymnasium environmental education is taught as part of the subjects geography, biology, physics and chemistry. No time allocation is given for these grades.

In geography regional planning and environmental protection, industrial geography and population and settlement geography are treated in grades 11 to 13.

In biology man and his animal and plant environment are analyzed in their ecological implications and biological anthropology is discussed in its implications for health care and the impact of environmental factors on man (grades 12 and 13).

In physics questions of natural as well as induced radiation are discussed in grades 11 to 13.

In chemistry soap and detergents, plastics and oil are discussed in their effects on man and his environment (grades 12 and 13).

Comprehensive School (grades 5 to 10)

In the comprehensive school (Gesamtschule), which as has been noted earlier is still run on an experimental scale, a wide range of subjects is involved in environmental education. They are: geography, biology, physics, chemistry, industrial arts (Arbeitslehre), politics and nature and technology (Natur und Technik).

In the comprehensive school environmental education is given higher priority than in the regular tripartite system of education. This seems to be a proof for the claim of comprehensive education that its curricula are more oriented towards actual life. An overview of environmental education in the comprehensive school is given in Appendix A.

Methods and Media of Learning

Environmental topics are regarded as highly complex issues. Therefore the project approach is often applied in teaching environmental education. It reflects the interdisciplinary complexity of the subject matter and helps to facilitate the combination of theoretical considerations and practical experience, an aspect which is important for environmental education.

On the whole quite a portion of Hamburg public education still is teacher centred, but the tendency is going towards more learner oriented methods of instruction like group learning. The present day orientation of environmental education, its interdisciplinary background, and its implicit possibilities for demonstrations in the environment itself have made it a vehicle for reform in the methods of teaching.

Furthermore, the use of media in teaching environmental education has reached a high level. The Instiutte for Film and Picture in Research and Instruction (Institut für Film und Bild in Wissenschaft und Unterricht, FWU)

offers about 210 films and video cassettes on environmental topics. For biology alone about 60 titles are available. Educational Television (Schulfernsehen III) is also offering environmental topics under most of its subject headings (See Appendix B).

3.2.3 Evaluation of student achievement

Hamburg public education, like public education in all the other "Länder" relies on a promotional system where students are awarded grades for their achievement two times per year. These grades are the result of written tests and oral achievement in the particular subject. Hence, environmental education is also integrated into this system and is part of the written tests and the evaluation of oral achievement in all the subjects which include environmental topics.

3.2.4 Teacher education

Teacher education in Hamburg is based on a two phase model. The first, theoretical phase has the form of an eight plus semester course of study at a university or teacher's training college. This is followed by a 1.1/2 year "apprenticeship" in the schools. Accordingly, teacher certification is divided into a theoretical examination after phase one and a practical examination after phase two. While teaching experience in phase two necessarily corresponds with the curriculum guidelines (Rahmenlehrpläne), there is considerable flexibility in the offerings of phase one. The timetable of Hamburg University indicates that environmental topics are emphasized in all subject areas quoted above and that the School of Education in particular offers a wide range of courses regarding the contents and methods of environmental education. Beyond course offerings in the didactics of the particular subject areas general questions of teacher education are often connected with environmental topics, due to the priority given to this problem area[10].

In-service education of teachers in Hamburg has been kept on a limited scale, due to financial restrictions. In the timetable for the first six months of 1984 a total of 403 courses and lectures are listed, which fall under 27 subjects and 9 other headings. Hence, only a small number of courses and lectures are addressed towards contentual questions of each subject area. The entries are therefore in most cases formulated in a general way (such as: "Physics for Grade 10 of Comprehensive Schools"), without special reference to environmental questions. Only rare examples exist of environmental topics such as "Information, Materials and Media Regarding Questions of Environmental Protection" in geography and "Selected Experiments Regarding the Environment", "Ecological Studies on Forests" and "Possibilities of Teaching Urban Ecology from an Example in Planning in Biology". It is expected, however, that the actual course contents demonstrate wider coverage of issues in environmental education[11].

3.2.5 Overall observations

Environmental education receives wide coverage on all levels of the Hamburg education system through a variety of subjects from the social as well as the natural sciences. On the basis of federal provision for environmental education as stated in the agreement of the Standing Conference of the Ministers of Culture of the States from 17 October 1980 a concept of environmental education is advocated which goes beyond creating an awareness of environmental problems and their importance for the future of mankind. Instruction in the natural sciences is meant to transmit detailed insight into the causes of environmental strain and their impact on the present world population as well as on the generations to come. Instruction in the social sciences analyses the conflicting interests behind exploitation and protection of the environment and outlines alternative scenarios for social planning. The student will have to understand that he has to take part in the responsibility for environmental

policy and that this policy determines part of the orientation marks of our life.

It could be demonstrated that teacher education and the media provide adequate support for environmental education in carrying out its important role. The highly diversified supply of films and video cassettes on environmental topics seems to match the wide range of content areas to be found in environmental education curricula. However, the importance attributed to environmental issues has not yet resulted in the establishment of environmental education as a subject area of its own. So far the task is carried out in a multi-disciplinary and partly project-oriented approach with "Sachunterricht" and geography as the two main subject areas. It is difficult to predict whether or not the co-operation between the subject areas will be effective enough, so that the demanding goals of environmental education can be realized without unduly curtailing the complexity of the field. A pilot study found that students attitudes regarding environmental questions were highly developed, but that the inclination to get actively involved in protecting the environment was fairly low[12].

3.3 India

3.3.1 National policy on the environment and environmental education

In 1972 the Government of India set up a National Committee on Environmental Planning and Co-ordination. This apex body at the national level identifies important problems and seeks solutions, and reviews policies and programmes. Environmental Boards have been set up in every State with the Chief Minister of the State as Chairman. A separate Department of Environment has been set up with a Minister of State in charge to co-ordinate the activities and advise the Government on environmental matters. India's concern about the environment dates back to the ancient times of the Indo-Aryan civilization which was nurtured amidst the grandeur and sublimity of nature. Referring to more recent developments in the field of education, it has been stated that[13]:

> While the contemporary thrust on environmental education to meet the urgent needs of Indian society is quite new, India has a long tradition of using the surroundings as a basis for learning. The movement of Basic Education launched by Mahatma Gandhi was a landmark in the history of education in India. The essential elements of Basic Education are ... correlation of the curriculum with the productive activity and the physical and social environment and intimate contact between the school and the local community. ... The Report of the Education Commission (1964-66) incorporates the best that Basic Education has to offer, and lays emphasis on the 'international transformation' of education so as to relate it to the life, needs and aspirations of the nation.

Some elements of environmental education are seen in the recommendations of the Education Commission (1964-66)[14]:

> The aims of teaching science in the primary school should be to develop proper understanding of the main facts, concepts, principles and processes in the physical and biological environment. In the lower primary classes, the focus should be on the child's environment - social, physical and biological ... The child may also be introduced to formal areas of science such as the plants and animals in his surroundings, the air he breathes, the water he drinks, the earth he lives on ...
>
> At the higher primary stage environmental activities will lead to the study of natural and physical sciences, history, geography and civics ...

In a Policy Resolution adopted by the Government in 1968, the main recommendations of the Education Commission were accepted and the necessity of evolving a national consensus on a new curriculum with emphasis on environmental education became manifest. As a result, curriculum guides were prepared which emphasized that elements of environmental education should cut across the entire gamut of school education through relevant subjects. For the primary stage, the curriculum guides recommended[15]:

> ... The child should learn the method of inquiry in science and should begin to appreciate science and technology in the life and world around it. ... The child should develop habits of cleanliness and healthful living and an understanding of the proper sanitation and hygiene of its neighbourhood. ... The child should acquire a taste for the good and the beautiful and should take care of its surroundings.
>
> In the middle stage:
>
> ... environmental education, nutrition, health and population education should receive adequate attention so that science is related meaningfully to life.

At the secondary stage:

> ... In science and mathematics, the student should have competence to apply his knowledge to the solution of problems around him. He should have an understanding of the technological processes in agriculture and industry in his surroundings. He should be able to contribute meaningfully to environmental conservation, reduction of pollution, development of proper nutrition, health and hygiene in the community...

A committee set up to review the curriculum prepared on the above guidelines while re-emphasising the need for stressing more the environment based education for the first ten years of schooling made a further recommendation that besides sciences in general and the science of life in particular, socially productive work should also be made environment-oriented with emphasis on problems related to the environment.(see also Appendix C)

3.3.2 Curriculum for environmental education

The elements of environmental education incorporated in the school curriculum may be recognized as falling into three categories:

- education for the environment
- education about the environment
- education through the environment

The Primary Level (Grades I - IV/V) - 'Environmental Studies' has been identified as an important area of study for the accomplishment of many of the objectives related to the natural and social environment at the primary stage of schooling. Concepts relevant to environmental education are found in some of the topics around which this curriculum is developed, e.g.

1. Our Family - basic needs such as air, water and food, hygienic practices.
2. Our Home - materials used for building, cleanliness of the house and the compound, types of materials used for clothing.
3. The School - facilities such as drinking water, toilets, school garden, maintenance of buildings and compound.
4. Our Neighbourhood - geographical features, significance and life of plants and animals, production of commodities, sanitation, amenities.

5. Our Earth - diversity of life, the atmosphere, man changes the surface of the earth, soil, minerals, exploitation of natural resources.

6. Our Sky - the weather, rain, wind, etc.

The Middle Level (Grades V/VI - VII/VIII) - At this level, environmental studies or environmental education is not prescribed as a subject. But 'Science - an integrated course' contains much content relevant to the environment as illustrated by topics such as:

- man's dependence on plants and animals;
- balance of nature;
- population;
- pollution.

The Secondary Level - The concern for the environment in the subject of science is indicated by the inclusion of topics such as:

- ecosystem
- biosphere
- ecological crisis
- conservation of natural resources
- national and international efforts in the conservation of nature.

Strategies for Introducing Environmental Education

'Environmental Studies' is taught as a separate subject in grades I to V. In grades I and II, the social and physical aspects of the environment are studied without being differentiated as such under the six units mentioned above (see Primary Level). In grades III to V, Environmental Studies Part I deals with the social studies component and Part II with the science component. At this stage, the pupil is gradually introduced to life in his home and family, school, neighbourhood, state, country and the world at large. The content in Part I is drawn mainly from different social sciences such as

geography, history and civics. The units relating to environmental education are based particularly on geography, e.g., the geographical settings in the district and state is which the pupil lives, the life of the people in some parts of India, the material resources of the country, their development and the life and occupations of people in different environments in various parts of the world.

At the middle school level, elements drawn from different social sciences are taught separately under three subjects, viz. history, geography and civics. The focus of the course at this stage is on the interaction between man and his physical and social environments. The integrated science curriculum is environment based and directed primarily to attain certain abilities essential for living in the changing environment.

The understanding about the social and physical environment which is developed at the middle stage is further reinforced at the secondary stage through a programme of general education which includes the study of history, geography and civics as separate subjects. At the higher secondary stage, the geography course includes some of the aspects of environmental education.

The general science and biology curricula reflect a radical shift from the traditional factual content to the inclusion of content related to the emerging contemporary aspects of environmental-oriented and social relevant problems.

In the nationally developed curricula for all stages the following aspects of environmental education have been specially emphasised[13]:

(a) Population	History of population growth, population growth, crisis and problems of unplanned population
(b) Land	Land use, land reclamation, land and soil conservation
(c) Resources and their uses	Resources uses, conservation, recycling, water uses and conservation, energy uses and conservation

(d) Food and nutrition	Food production, types, quality and supply, uses of food, food adulteration and preservation, nutritive values of foods, balanced diet, deficiency diseases and their eradication
(e) Conservation	Conservation of wildlife, forests, soil, water and air, conservation of other non-renewable natural resources; preservation of natural beauty
(f) Pollution	Pollution of water, air and soil; noise pollution; pollution by pesticides and other chemicals; waste disposal
(g) Health and hygiene	Individual, family, community and social health and hygiene; health hazards; communicable and non-communicable diseases
(h) Man in nature	Man in relation to other components of biosphere; environmental quality and man's future on earth.

The analysis of the instructional materials developed by NCERT reveals that the treatment of various aspects of environmental education covered in the curricular materials predominantly dwells on education through the environment (method: skill) and about the environment (content: knowledge, understanding) and ventures into the area of education for the environment (goal: attitudes, commitment) in nutrition, health, hygiene, environmental sanitation, soil conservation, etc.

Learner Activities

A variety of learner activities are proposed in the curriculum[16], e.g.: In grades I and II the learning is mainly through activities based on observation of the local environment (both social and physical) and consolidation of the knowledge thus gained through discussion. In grades III to V, besides the observation-discussion type of activities, children perform experiments and investigations, but always using things that are locally available.

These activities may involve science processes like measuring, collecting and classifying, making a record, and analysing data. In the integrated science course for grades VI to VIII, the textbook chapters follow a sequence

that suggest the strategy of organizing the learning activities. The first section of the chapter includes a number of observations from the daily life experience of a child. The second section gives 'questions' that follow logically and naturally from the first section. These are the questions that many children would often ask. Answers to these questions or necessary informations to get the answer is provided in the third section. The next section on 'Activities' gives practical exercises which students may do in school or at home. These exercises are designed to make learners think and also develop certain skills, as well as to consolidate knowledge.

3.3.3 Teacher Education

Teacher education programmes so far have been limited to in-service courses. Several approaches for the introduction of environmental education to teacher education courses have been suggested:[13]

> Environmental Education as a Seperate Discipline (Infused or Interdisciplinary): One approach can be to offer environmental education as a seperate discipline in the teacher training programme. This course may be taught by using the approach of content-cum-methodology. In this approach, a problem or unit is selected and its concepts are identified. The concepts are discussed one by one from the content point of view by using the appropriate techniques teaching like observation, demonstration, experimentation, discussion, etc. Since content will be related to environment it will also be used as a technique for teaching the content. Those taught being teacher trainees, the related higher concepts of environmental education may also be discussed in the course of teaching. This approach has to be activity based so that the trainees are well prepared for the task of teaching.
>
> However, this approach has several other implications. It cuts across various subject areas and it will be necessary to coordinate such programmes with other subject specialisations. Another implication is to find time to teach this course separately. This option may be kept open for institutions which are in a position to offer it as a separate course. It is desirable in this context, that a course on environmental education to be offered as a separate paper, is developed as a model.
> Integration of Concepts of Environmental Education in Other Fields of Specialisation:. In this approach the various concepts of environmental education may be integrated with other subject areas such as social sciences, physical science and humanities (infusion or

multidisciplinary). This approach appears to be more practical because the related concepts of environmental education can be integrated with the relevant specialisations. Moreover, it will not increase the burden on the students and will be taught through the panchayat system in a village and through civic bodies in a town.

Combination of Both the Approaches: Another approach for the Introduction of environmental education in the preservice teacher training can be a combination of both the approaches discussed above. The concept of environmental education may be studied to find out which of them can be integrated with different subject areas. Only those concepts should be taught in an integrated manner which are related and can be well infused with specialisation The other concepts which cannot be integrated easily may form a separate small course or a unit and may be offered in the teacher training programme as a compulsory paper.

It is necessary to mention in this context that model programmes for all the three different approaches are developed by some agencies like NCERT/SCERTs so that teacher training institutions may either use them as such or develop their own programmes.
The preservice teacher training programme, however, takes care of only those teachers who are likely to be employed in the future But what about the large number of teachers who are already in service but have not had training in environmental education?
It is, therefore, necessary that a massive programme of environmental education is developed for inservice teachers. There are several factors which should be considered while offering inservice education to teachers. One of these factors is the time involved, bacause the teachers in service cannot be spared from their schools for a long period of training. The other consideration is the expenditure involved. If the period of training is long, the expenditure to be incurred for such a large number of teachers will be very heavy. The other factor to be considered is the availability of resource persons required for giving inservice training. Even so, there can be several forms of inservice training for teachers in environmental education.
Contact Programme: The inservice education for teachers can be organised by offering contact programmes of three to four weeks' duration in which the approach and methodology of teaching environmental education may be discussed. They should include demonstration lessons by the resource persons. Some selected units may be taken up for actual teaching and discussed with teachers.
Development of Teachers' Guides and Modules: Another approach for inservice training of teachers in environmental education can be by development of teachers' guides and self-learning modules on various concepts. The Materials may be developed on programmed learning techniques and distributed to the teachers free of cost, if possible, or they may be priced very low so that teachers are able to make use of them conveniently. It is, however, necessary that the teachers who are provided inservice training through this approach are evaluated, to ensure that they have been benefited by the training. The evaluation may be done by asking the teachers to complete some assignment sheets or write answers to some questions to be returned to the State Department where these may be analysed and remedial steps suggested.

Correspondence Course: Inservice training in environmental education can also be provided through correspondence courses. These may be arranged by the University departments, teacher training institutions and SIEs/SCERTs. Such courses have to reach the teachers regularly. It is also necessary to obtain the assignment sheets from the teachers in time to evaluate them properly and to send them to the teachers for their guidance. The materials may be well illustrated so that teachers are able to perform the suggested activities.

The Uses of Mass Media: Inservice training in environmental education can also be provided through mass media such as the newspapers, the radio and the television. There is an increasing use of the radio and the television for providing inservice education in various areas such as agriculture. The media can be used very effectively for inservice training for teachers whereever these are available easily and where teachers reside in far-flung, inaccessible areas.

It is, however, to be seen which particular approach will be suitable in a particular area or situation. A combination of two or more approaches can be used for providing inservice education.

But it would be essential to take into account the approaches which are followed for environmental education at different levels of schooling, while training teachers for environmental education through either the preservice or the inservice course.

Irrespective of the approach, teacher preparation should include:
- Basic training in ecology
- Field and/or Laboratory experiences for teachers in the area of environments science-
- Knowledge of environmetal issues and the problems of resource management.
- Competencies in environmental problem identification, investigation, evaluation, and citizenship action.
- Opportunities to develop value clarifications, skills and knowledge of the role of human values in environmental issues.

It would be necessary for institutions like NCERT to develop model programmes to be used in different approaches for the guidance of States and universities.

It is thus evident that the environmental education programme has implications for both the inservice and the preservice education of teachers. In order to implement it successfully, the models of programmes to be used in different approaches and the instructional materials based on the suggested model course should be developed by the concerned agencies.

3.3.4 Constraints and Difficulties in the Implementation of Environmental Education

The following constraints and difficulties have been reported:[13]

The difficulties in the effective implementation of environmental education are most likely to arise from the very nature of environmental education in laying stress on attitudes, motivations and commitments.

Once administrative decisions are taken to have environmental education for all pupils in the school system, it is comparatively easy to re-draft or modify the syllabus content and develop corresponding textual materials. The difficulty would arise in the area of teacher preparation and in the effective implementation of the new dimension or content area of environmental education through the teachers. Some constraints in the proper implementation are indicated below.

The environment for any learner may be considered to have a 'local' and a 'global' aspect. The local is immediately perceptible to even young learners. The global dimension is a little subtle and, in a sense, controls/regulates the local. The two dimensions are closely inter-related; with increasing mobility as a result of the rapid advance in science and technology, the gap between these two environmental aspects is dwindling. And here comes the constraint to focus on commitment to preserve and promote environmental quality. One may start losing hope in the face of the deteriorating quality of one's local environment caused by decisions and actions of others in comparatively distant environments.

A similar difficulty may arise in the domain of value clarification through self-awareness by developing an ever-evolving knowledge/under standing about environmental inter-relations. One may be very soon driven to the conclusion that what is bad/unethical from an individual's point of view is good, or at least taken to be good, from the national angle. There may be opposite currents of commitment which may make it difficult to maintain environmental quality at different organizational levels of human society.

There is tremendous variety in the environment of learners, as there is in the capacity of learners. The process of curriculum development has of necessity to be decentralised as far as possible. This diversity and flexibility of the environmental education curriculum may appear to some to be in conflict with the necessity of keeping uniform national standards.. Some rapprochement is sought through evolving a minimum learning continuum for all primary pupils and then allowing for variations in the details of activities or additional knowledge on the basis of the State or the region..

Teacher preparation is likely to prove the greatest hurdle in the effective implementation of environmental education. This may be due to several reasons. Firstly, the total number of teachers to be oriented is too large, secondly, to bring about a change of attitudes in teachers to develop a sort of commitment for the environment, which is the primary aim of environmental education, is a herculean task. Unless teachers are committed to environmental education goals/ objectives they cannot motivate their pupils. Further, with advancing age it is difficult to bring in attitudinal changes.

Practical Difficulties Experienced by Teachers

Some of the difficulties experienced in the implementation of environmental education are:

- the classroom teacher faces a problem in getting proper guidance to carry out some of the activities planned;

-supplementary and reference materials are not easily available;
-the teacher does not get administrative support unless fellow teachers, headmasters and supervisory staff are also properly oriented for the environmental programme;
-the teacher gets little time for proper planning of activities;
-the teacher loses interest in the new approach in the absence of regular follow-up action.
-the insistence on completion of the syllabus places several constraints on teachers to be innovative.

The cause of environmental education has to be taken up with missionary zeal and in a crusading spirit. At the micro-level the task may seem to be hopelessly difficult or fruitless; even then one has to go on in the hope that good sense would prevail upon all the big centres of the decision-making processes some day, to save humanity from the impending doom.

3.4 Jamaica

The ecological realities of a small island like Jamaica present special challenges for environmental education. Not only is Jamaica's size an important consideration in the area of environmental preservation but also its topography, rock and soil type. These factors, and in addition, a rapidly expanding population has created an awareness and a need for the development of an environmental education programme.

3.4.1 National Policy on the Environment and Environmental Education

The national policy on the environment was based on some of Jamaica's major environmental problems such as:

-pollution of the seas and rivers
-pollution of the air
-reduced stream/river flow and the lowering of the water table
-soil erosion
-population pressures
-destruction of swamps and forests
-pollution of the land
-depletion of marine resources

Some legal measures have been taken to solve some of the above problems, e.g. Wild Life Protection Act, the Beach Control Act, Watershed Protection Act.

Most of the environmental education programmes are of a non-formal nature. These programmes are carried out by government agencies most directly concerned with environmental matters - the Natural Resources Conservation Department and the Environmental Control Division of the Ministry of Health.

The Ministry of Education is concerned with the introduction of environmental education to the school curriculum.

3.4.2 Curriculum for Environmental Education

Action for the introduction of environmental education into the school curriculum was initiated as follows[17]:

The Jamaica National Commission for Unesco in collaboration with the Ministry of Education organized a national workshop on environmental education on March 3-5, 1981. This workshop was a direct follow-up to the Unesco Sub-regional workshop held in Antigua, June 9-2o, 198o.

The objectives of the workshop were:

1. to sensitize teachers, supervisors, education officers and teacher trainers to the environment and its problems;
2. to acquaint participants with the goals, objectives and teaching methodologies in environmental education;
3. to encourage in participants an attitude of respect for, and care about the environment;
4. to help participants to formulate ways of including environmental education in the education programme;
5. to prepare participants to be able to conduct follow-up workshops at the parish level.

The workshop dealt with background information on the environment-

-What is the environment?
-Environmental controls -Management of ocean and coastal system in relationship to the environment.
-Folk culture and its ralationship to the environment.

The rest of the workshop's time was spent introducing participants to enviromental education and identifying those areas of the school

curricula that best lend themselves to the development of environmental education programmes. The general science, social studies and agricultural science programmes for grades 7-9 in the secondary schools proved to be most suited for the purpose.

General Science - Grade 7

Unit 1	Science and Us
Unit 2	Classification
Unit 3	Our Place in the Universe
Unit 4	Life goes on

Grade 8

Unit 5	Weather and everyday life
Unit 6	What living things are made of
Unit 7	How living things work
Unit 8	Electricity - a form of energy

Agricultural Science-Grade 7 Soils, Plants, Animals

Grade 8 Crops, Tillage, Plant Protection

Grade 9 Animal Husbandry, Plant Protection, Irrigation, Agro-economics

Social Studies

Grade 7

1. Our School and Local Community
2. Our Ancestors

Grade 8

1. Jamaica - Our Land
2. Jamaica - Our Population
3. Jamaica - Our Social and Political Development
4. Economic Activity in Jamaica

Grade 9

1. On being a citizen
2. The Government of Jamaica
3. Jamaica's links with other countries

These units along with others from history and geography were reorganized to place greater emphasis on environmental factors.

The following objectives which are relevant to environmental education have been included in the Social Studies curriculum:

- -Appreciating the necessity for maximum development and use of human resources, land and capital.
- -Using the resources of the country to the benefit of the maximum number of people
- -Understanding the factors which contribute to sub-standard living conditions and the effects of slums and inadequate housing
- -seeking to improve the society in which we live.

3.4.3 Teacher Education

Institutions like the University, College of Arts, Science and Technology, West Indies School of Public Health and Teachers Colleges all either teach environmental education or have had environmental education infused into their curricula, specially in science and science based areas, and social studies over the last few years.

The University of West Indies Department of Geography and the Natural Sciencesoffer courses directly relevant to environmental education.

The following have been stated as the objectives and content relevant to environmental education in the teacher education curriculum for pre-primary level teachers:

Aim: The pre-primary teacher should be able to stimulate and guide pupils to begin the discovery of their environments and to understand the processes of change.

Objectives: The student teachers should:

1. Develop a healthy curiosity and become observant of the

environment and stimulate these traits in pre-primary pupils.

2. Make the most effective use of resources (personnel and material) of the local environment.

3. Understand that curriculum is dynamic and requires adaptation, revision and change and be able to effect these as necessary for the local community and the society as a whole.

4. Select and present materials to stimulate discovery and learning.

5. Be able to transfer and apply learning from Education Courses to the teaching of Social and Environmental Studies.

6. To develop an appreciation for public and private property and to demonstrate concern for their preservation.

7. To help them develop acceptable social attitudes and to display respect for self and others.

8. To demonstrate love and loyalty for their homeland through a wider knowledge of, and participation in its affairs.

9. Practice the following skills:

Observation

Developing lesson and unit-plans

Collecting

Recording

Reporting

Note-making and arranging information

Reading for information

Making and reading maps

Making and reading graphs

Constructing simple questionnaires and interviews

Drawing

Making models

Content:

Geography

(a) Landscape

(b) Climate and weather

(c) Relationship between man and (a) & (b)

Science

(a) Relationship between man and other living things

(b) Nature of crust of the earth and how it helps to support life

(c) Structure of the universe

(d) Nature study - Plant collection (with names)
Seed collection
Germination experiments
Leaf Collection
Animals- wild and domestic

Health Science

(a) Food and Nutrition

(b) First Aid

3.5. Japan

The roots of environmental education in Japan can be traced back to the concern shown immediately after the second world war for nature protection and conservation education. Environmental education in the broader modern sense is dated as beginning under the impact of the UN conference on the Human Environment held in Stockholm in 1972.

3.5.1 National Policy in the Environment and Environmental Education

The rapid industralization and the rural and regional development projects started during the post-war period brought with them environmental problems such as pollution. Recognizing the need for suitable remedial action, the Government established in 1964 a committee for the Formulation of Counter measures against Pollution. Thereafter, the Fundamental Law of Counter measures against Environmental Pollution (1967) and other regulations concerning pollution were promulgated. The Environmental Agency was set up in 1971 to co-ordinate environmental administration dealing with the prevention of pollution and preservation of the natural environment. In co-operation with Environmental Agency, the Ministry of Education, Science and Culture has taken steps to provide suitable environmental education programmes to schools to complement the various efforts of other ministries and agencies. A special Research Project on Environmental Science Education was conducted under the auspices of the Ministry of Education aiming at establishing the need, objectives, guidelines and main themes of environmental education. In the course of the project, an International Symposium on Environmental Education was held in 1974 which concluded with the "Tokyo Declaration of 1974" on the "critical need of environmental education and the extreme importance of an interdisciplinary approach in this field".

3.5.2 Curriculum for Environmental Education

Environmental Education in elementary, lower secondary and upper secondary schools comes mainly under the subjects of Science and Social Studies. Due to the diversity of the content of environmental education, some of its aspects may be identified in several other subjects too:

Elementary Level: Home-making, Moral Education and Co-curricular (special) Activities

Lower Secondary Level: Physical Education, Handicrafts/Home Making, Moral Education and Co-curricular (special) Activities.

Elementary Level (grades I-VI): The objectives and content related to environmental education in the relevant subjects are as follows[18] :

Social Studies Objectives

Grade 3 - To make pupils understand that the life of the people in the region is closely related to the natural environment.

Grade 4 - To make pupils understand that the people are making their living by adapting themselves to the natural environment.

Grade 5 - To have pupils understand the features of the land as geographic environment, and to help pupils deepen their interest in the preservation of the environment and effective use of resources.

Content

Grade 3 - To understand the state of land utilization, the the relationship between the life of the people and their natural environment ..... utilization of raw material and resources.

Grade 4 - To understand the way in which people are making their living by adapting themselves to the environment.

Grade 5 - To understand the efforts to preserve fishing grounds, development of fishing resources, to protect the health and living environment of people from various public nuisances.
To examine the location of land, distribution of resources, population distribution, and to deepen the understanding of the characteristics of the land as geographical environment.

Science - Objectives

Overall Objective: To develop the ability in and attitude towards making inquiries about nature through observations and experiments as well as to enhance their understanding of natural things and phenomena, thereby, nurturing a rich sensitivity to love nature.

Grade 1 - To recognize conspicuous features of living things in their surroundings through such activities as searching for and taking care of them.

- To familiarize them with surrounding natural things and phenomena, recognize conspicuous features through observation and experiments, and experience the pleasure of contact with them.

Grade 2 - To make pupils notice the ways of living and growth of living things; become familiar with natural things and phenomena and how they change.

Grade 5 - To have pupils understand that living things grow under the influence of their environment, and develop an attitude of respecting life.

Grade 6 - Develop an interest in interrelationship between living things and their environment.

Content

Grade 1 - Notice special features in terms of colour shapes, etc. of plants and materials.

Grade 2 - Notice the growth of plants, how they grow diffently under different conditions.

Grade 4 - Functions of running water.

Grade 5 - Investigate germination and growth

Grade 6 - Functions of water and sunlight, observe natural phenomena.

Points for special consideration in teaching:

- Consideration should be paid to helping pupils grasp the characteristics of nature through such activities as observing, searching for and raising and producing various things in nature.
- For the teaching about living things, weather, strata, etc., it is necessary to take pupils outside the school, to get closer contact

with the nature and to help develop an interest in the preservation of nature.

Lower Secondary Level (grade 1 - 3)

Extracts of objectives and content relevant to environmental education[19]:

Social Studies - Objectives

- To make students notice that the relations of human beings with natural and social conditions have continuously undergone changes due to human activities and that each region has also been transformed correspondingly, and recognize the importance of the environment and resources.

Content

- The earth as an arena of life
- Population and habitation, population distribution, increase, decrease and movement; development of cities, pay attention to the problems such as food, resources, industry and urbanization.
- Understand the importance of rational utilization and preservation of the national land for the purpose of stabilizing and improving the the national life.
- Prevention of pollution, development of resources, energy and their effective use.
- Role of local and national governments and the responsibilities of individuals and enterprises.

Science - Objectives

Overall Objective- To develop student's ability in and positive attitude towards making inquiries about nature through observations and experiments as well as to enhance the understanding of matters and phenomena in nature. Thus to have students realize the relationship between nature and human beings.

- To make students consider the relationships between matters and phenomena in the natural world as well as the harmony among them, and realise the influence of

the natural environment on the existence of human beings, thereby heightening students' interest preservation of the natural environment, develop a positive attitude towards the appreciation of life.

Content

-Nature and living things, kinds and structure of plants and animals, their connection with the environment.

-Human beings and nature, the conditions which sustain the existence of human beings on the basis of fundamental understanding of the natural environment.

-Balance in nature and preservation of the natural environment.

-Conserve the environment by preserving and regulating nature.

Health - Objectives

-To understand the relationship between health and environment, and foster the ability and attitude to maintain and improve the environment which is good for the health.

Content

-Mattersconcerning health and environment, concentration of carbon dioxide in a room, imperfect combustion, carbon monoxide, acceptable limits.

-Value of sunlight.

-Hygienic management of wastes produced by human and industrial activities.

Point for special consideration in teaching : consideration should be given to the relationship between pollution and health in accordance with the actual conditions of the region.

Moral Education - Objectives

-To have a rich heart capable of loving nature, to think about the relationship between nature and man, to have a heart capable

of loving nature and things that are beautiful.

Upper Secondary Level

Extracts of objectives and content relevant to environmental education[20].

Social Studies

-Basic problems of the contemporary society, human beings and environment, prevention of pollution.

-Human being and the earth, natural environment and social environment.

-Population, natural resources and industries, regional development and preservation of the environment.

-Urbanization and problems in cities.

-Development of science and technology, use of resources and energy.

Science

Objective - To understand principles and laws as well as to realise the relationship between nature and human life and evolution and balance found in the natural world

Content

- Balance of the natural world, ecosystems and circulation of substances.

-Man and nature, resources, preservation of the natural environment, influence of the natural environment on human beings and the influence of human activities on nature.

-Surveys of the natural environment, field work concerning biology and earth sciences and various problems related to the natural environment.

-Organization of and changes in biotic communities.

Points for special consideration:

In the teaching of the content, due attention should be paid to the fostering of attitudes towards respect for living things and preservation of the natural environment.

Health -Objectives

To have students deepen their understanding of the functions of body and mind, the relationship between health and environment.

Content

-Health and environment, injury to health due to environmental pollution and prevention of the pollution of natural environment.

-Legal measures of prevention of pollution.

Activities and Projects

In accordance with the recommendation that the teaching of environmental education should involve direct experiences with nature, various projects and activities carried out as a part of the course are reported[21].

An example of a junior secondary level project:

Project- Let us Introduce Nature into Our School

Even though teachers in city schools recognize the importance of providing direct experiences to pupils on the natural environment, certain practical difficulties are encountered due to limitations of the urban environment. One such problems was giving pupils of a city school an opportunity of studying a forest. Since a forest was not available in the neighbourhood, the teachers and pupils decided to set up a natural forest in the school ground. In this project, they collected about 100 different species of trees growing in forests and planted them in the school garden in a plot covering 224 sq meters. Three years later, this artificial forest developed sufficiently well to demonstrate the characteristics of a natural forest and was used to study ecological systems.

An example of a senior secondary level project:

Project: Effect of Industrial Development on Environmental Pollution

The Biwa lake near Osaka is the source of drinking water for about 13 million people. With industrial development in the area, the lake water was getting polluted. A project was designed to:

-assess the extent of pollution

-examine the effect of pollution on life in the lake

-understand the cause of pollution

-discuss ways of preventing pollution.

In the course of this project, they carried out experiments in quantitative analysis, studied similar problems in other countries and gathered valuable practical experience in the investigation of environmental problems.

3.5.3 Teacher Education

Since the content of environmental education is included mainly under the subject social studies and science, the environmental education component of teacher education is also carried out in the courses for teachers of those subjects.

In order to facilitate understanding of the new courses and to ensure appropriate teaching on environmental education in the classroom, the following measures have been taken:

-all primary and secondary school teachers were required to undergo in-service teacher education courses.

- teachers manuals have been prepared for the teaching of each subject area in lower secondary schools.

3. 6. Republic of Kenya

The philosophy of environmental education is not new in Kenya and has been present in various subject disciplines such as science, economics, geography and agriculture. It gathered momentum after the Stockholm conference in 1972 which led to the establishment of the United Nations Environment Programmes (UNEP) in Nairobi.

3.6.1 National Policy on the Environment and Environmental Education

The National Environment Secretariat (NES) was established as a permanent agency in the office of the President in 1972. The National Committee on Educational Policy and objectives was established in 1975. A National Committee to co-ordinate Environmental Education programmes in Kenya was established in 1976.

The need for environmental education and its importance in development strategies has been highlighted in the Development Plan 1979- 1983 and stressed by the late President Kenyatta. It is stated that the Belgrade Charter and its interpretation in the context of the African Region constitute a basic reference for guiding Kenya in the formulation of a national conceptual framework for environmental education. The National Environment Secretariat considers evironmental education to be a powerful tool for the preservation of the environment in its varied dimensions. To meet these needs the Secretariat has established an Environmental Education Section which works in close collaboration with educational institutions such as the Kenya Institute of Education, Kenyatta University College and Kenya Science Teachers College.

3.6.2 Curriculum for Environmental Education

National efforts for the development of environmental education have been in existence for some years, even before the international programmes were launched as stated below[22]:

It must be stressed that envrionmental education existed in Kenyan primary and secondary schools and also at tertiary level long before the international outcry for environmental education to safeguard against the world-wide environmental crises. Indeed many curriculum changes embracing environmental concepts had been taking place in Kenya for some time before the 1972 Stockholm Conference.

Courses were not offered as environmental education as such, but as an integral part of subjects such as Geography, General Science, Biological Sciences, and the African Social Studies Programme (A.S.S.P.). The significance of forests to rainfall was one of the topics that formed part of the Geography syllabus, while examples of other topics which are significant to the environment including soil erosion and crop rotation were dealt with at length in Agriculture and Geography lessons. Pollution was taught in relation to Hygiene in General Science, and emphasised the utilization of pit latrines as a preventive measure in the control of water-borne diseases. The earlier presence of environmental education within existing curricula could be further amplified with many more examples such as these from other subject disciplines.

In the following sections are some examples of the possible interpretations of environmental education concepts within the context of subject centred and multi-disciplinary curricula[22]:

The African Social Studies Programme (ASSP)

The modern concept of environmental education defines an inter-disciplinary process, since environmental phenomena encompass a wide spectrum of concepts, principles and experiences. For example, the natural sciences bring out important things about the natural environment, ecological principles, ecosystems, etc., and inter-relationships among these; the social sciences deal with human ecology and human interactions; the creative arts provide a means of expression for man's response to this total environment, and language arts provide a framework for understanding and communicating our knowledge ideas and feelings, and so providing a way to deal with our environment. In the ASSP we are trying to provide to ourselves, and to explain to the world how effectively the social studies mechanisms can be translated into action programmes like citizenship education, population education, peace education and so on. In this way we hope the African Social Studies Programme will contribute to environmental education.

A further approach to environmental problems is made through the study of the interaction of major components such as rural, urban, industrial and historical upon the natural environment.

- Historical Environmental Perspectives: Historical surveys of the changing patterns of land use and human activities. Studying the effects of technological development upon man and the environment and of man's attempts to restore and maintain environmental quality.
- The Rural Environment: Surveying the rural environment in terms of economic activities of ethnic, religious and occupational groupings. Studying the influence of the environment upon the cultural traditions of rural people.

- The Urban Environment: Investigating the historical background of the city to explain the factors affecting its development, size, ecological pattern, the nature and origins of its inhabitants. Ascertaining the impact of urban development and related technology upon the social and physical environment of the city. Investigating the environmental management activities presently in effect.
- The Industrial Environment: Identifying the pattern, location, situational and site factors of industrial areas. Investigating the safety hazards and pollution associated with industry. Determining what management controls and procedures are already in operation, and indicating what additional management activities are necessary to maintain environmental quality.
- The Natural Environment: A study of man's interaction with and impact upon the natural environment. Investigating man's perception of the natural environment as reflected in his cultural activities and values. Classifying man's use of the land and natural resources. Identifying agencies responsible for the maintenance of environmental quality and indicating their functions and on-going programmes, with suggestions for further developments which would benefit the community.

Primary Education

The Kenya Primary Science Programme is a very good example to illustrate innovation in curriculum content and teaching methods at this level. In the lower primary level (grades I to III) pupils are presented with a variety of learning experiences to preserve, strengthen and to develop further, several of the attitudes and skills which form a strong foundation for the development of the ability to approach and solve problems in a rational and effective way. They are encouraged to continue to develop

their natural curiosity, and their willingness to explore and to ask questions, through direct experiences of their natural surroundings. In the middle primary level (grades IV-V) pupils are introduced to the process of solving problems. The work in the upper primary classes (grades VI and VII) consists of a series of investigations, each of which covers a range of scientific topics, concepts and skills that were previously treated as separate entities. Several booklets have been produced for use in lower primary classes of which the following are some titles: Plants in the Classroom, Dry Sand, Woodwork, Exploring the Local Community, Construction.

Secondary Education

The approach adapted in teaching environmental education in secondary schools in Kenya involves the inclusion of suitable curriculum units within the existing framework of the syllabuses of the East African certificate of Education. Examples include such topics as:

Man and Natural Resources, Principles of Land Use,

Sewage and Refuse Disposal.

A pilot project in environmental education was conducted at the Kiambu High School to spearhead the development in environmental education at the secondary level. The objective of the project was to link subject areas related to the environment, especially in science and social studies, so that both the scientific and social aspects of environmental education are developed.

Example of a Teaching Unit

Topic of Teaching Unit: Water

Water being the source of all life - of plants and animals - is important in the study of the environment.

Objectives

1. Identify sources of water in the country and in the immediate surroundings.

2. Identify and illustrate the water cycle in nature.
3. Identify by means of simple experiments the mechanical effect of water on soil.
4. Know the ways of dealing with soil erosion.
5. Identify the rainy and dry seasons, their effect on plants and the life of the people.
6. Identify the uses uf water, ways of obtaining it and distributing it.
7. Know ways of prevention of pollution.
9. Skill in making, using and maintaining water filters.
10. Identify the common symptoms of the main water - borne diseases and know methods of prevention.

Activities

Collecting information by observation, from books and enquiries, measuring, mapping and model building, simulation of real situation, field trips to observe community situations.

3.6.3 Teacher Education

Graduate teachers for secondary schools are trained at the University of Nairobi, Kenyatta University College and Kenya Science Teachers College (KSTC). KSTC has developed a one year course on environmental science for all students enrolled at the college. The major components of the course are ecology, ecosystems, demography, conservation, pollution, energy and food.

The course units incorporate both the theoratical and practical aspects of the study areas with project work in the field. The following is an example of a multi-disciplinary programme designed for use at under-graduate level for future teachers of environmental education[22].

The programme consists of three parts:

- Environmental Education Perspectives
- Environmental Studies
- Environmental Education Field Courses

- Environmental Education Perspectives: The nature of Environmental Education; Environmental Perspectives and Values; Environmental Education and the School Curriculum, Teaching Strategies for Environmental Education Programmes; Curriculum Process and Evaluation.
- Environmental Studies:The following sections have been chosen as representative of the multi-disciplinary areas of environmental studies and form the basis for further work to be conducted during the field study.
- Historical Environmental Perspectives; The Historical aspects of man's changing relationship to his environment. The influence of natural processes and human activities on environmental changes, including studies in Environmental Perception - Changing values; Family and Community; Economic and Political Issues; Cultural and Aesthetic Activities and Values; Language Acquisition; Technological Change and Environmental Management.
- The Urban Environment: A study of increasing industrialisation and commercial activities, with increasing numbers of people concentrating in urban centres. Studies in: Historical Background to Origin of Cities; Ecological Structure of Cities; Population; The Social and Economic Environment and Urban Environmental Management.
- The Industrial Environment: A study of the impact of industry and its products upon the environment, and of man's changing perceptions, values, activities and attitudes towards the environment. Industrial Land Use; Social/Cultural Structure; Economic Impact (of industrialisation on the individual and the community); Environmental Impact and Environment Management.

- The Natural Environment: A study of man's place in the natural environment, and the changes brought about as a result of his activities, including a study of: Natural Processes; Effects of Technological Changes on the Natural Environment; Man's Perception of the Natural Environment; Man's Demands on the Natural Environment; Man's Impact on the Natural Environment and Management of the Natural Environment.
- The Rural Environment: A study of the major areas of settlement in terms of space and numbers of inhabitants, whilst being the main source of food and natural resources to support increasing world demands. Including studies in Historical Background; Ecological Environment; Economic Structure; Cultural Patterns; Rural Environmental Management.

In addition to the above, various in-service education workshops are used to re-orient teachers for teaching the environmental education content under the relevant subjects. Resource materials and handbooks have been prepared for both trainees and tutors to prepare them in the effective implementation of the new approach.

3.7 Kuwait

Interest in the development of environmental education in Kuwait was stimulated by the UN Conference on the Human Environment and was led particularly by biologists and biology educators of the Arab Gulf States subregion.

3.7.1 National Policy on the Environment and Environmental Education

Since the Inter-governmental Environmental Education Conference of Tblisi, there has been a particularly strong movement in the Arab Gulf States to introduce environmental education into the school curriculum. Earlier some action had already been generated by a preparatory regional meeting organized in the framework of the UNESCO-UNEP International Environmental Education Programme and held in Kuwait. This was

followed by an environmental education workshop organized by the Arab League Education, Cultural and Scientific Organization (ALECSO).

The Kuwait Environmental Protection Society (KEPS) which is one of the most active environmental bodies in the Gulf area was set up in 1974 specifically to promote public awareness of, and provide information on protection of environment. The Department of Nature Protection is officially in charge of environmental protection activities.

Environmental Education at school level is presented primarily as an integrated part of the science courses.

3.7.2 Curriculum for Environmental Education

The environmental education curriculum in Kuwait forms a part of the revised science curriculum. The ALECSO biology project was the starting point of the development of an environmental education curriculum. This was followed by an integrated science project, "Man and his Environment" for grades 7 to 9, and the publication of two source books. The environmental education content is infused mainly into the school biology syllabus, particularly through units dealing with pollution, natural resources, food problems, environmental balance and desertification.

Content of Environmental Education in General Science

1. Elements of the Environment
   - introduction to the environment
   - elements of the environment
   - natural equilibrium in the environmental system
   - exploitation of the environment, problems created by man
   - environmental problems
2. Adaptation to the desert environment, effect of winds on the growth of plants

3. Composition of the earth, competition between plants and the environment
4. Exploitation of solar energy
5. Effects of air pollution

Senior Secondary Level: Man and the Environment

1. The Environment, composition and equilibrium, matter, atmosphere, water, land
2. Space, life in the universe, plants and animals, parasites
3. Food, living things and environment, natural equilibrium in the environment
4. Man exploits the environment, exploitation of non-renewable resources - metals, oil, coal
5. Solar energy, applications of solar energy, food production
6. Water, exploitation of water, chemicals from the sea
7. Air and its uses, energy, electricity, industrial development
8. Exploitation of renewable resources such as plants and animals
9. Environmental Problems
   - depletion of renewable and non-renewable resources
   - man's responsibility in the protection of the environment, land and seas, prevention of desertification, protection of sea coast, exploitation of ground water and oil
   - pollution, air pollution, water pollution, land pollution, noise pollution, food pollution, prevention of pollution from solids, chemicals, factory wastes, etc., relation between population and urbanization with pollution
10. Future of man and the environment
    - demography
    - food, drinking water

- metal resources
- solar energy
- pollution

11. Man and the Kuwaiti Environment

- the environment in Kuwait, desert and sea
- exploitation of the desert and the sea
- environmental problems in Kuwait
  (a) problems due to natural effects, salinity of land and drinking water, sand storms, heat, humidity
  (b) problems due to exploitation, desertification due to excessive expolitation, pollution

3.7.3 Teacher Education

At the teacher education level also, environmental concepts are presented principally in relation to science studies, e.g. an environmental oriented biology course called "Man and Natural Resources for Food, Clothing and Medicine" is provided by the Teacher's Training Institute. The faculty of Educational Studies of Kuwait University offers an environmental education course developed in the Department of Biology Education. The environmental education workshop organized by ALECSO developed three resource units for teachers at the primary, intermediate and secondary levels:

Primary - My Homeland

Intermediate - Natural Resources

Secondary - Energy

Modules on environmental Education for teachers are also used for the in-service training of teachers.

3.8 Malaysia

It had been recognized for a long time in Malaysia that the future generation must be equipped with a high degree of competence in understanding and managing the environment. Curriculum developers and science educators have been showing a concern for environmental problems resulting in the introduction of environmental concepts into the school curriculum.

3.8.1 National Policy on Environment and Environmental Education

A national policy on environment came into being with the Third Malaysia Plan (1976-1980), though the earlier plans (First and Second) also mention issues of environmental concern such as land capability classification and conservation. The Third Malaysia Plan, in its chapter entitled "Development and the Environment" spells out the national environmental policy, recognizing that[23]:

> it is vital that the objectives of development and environmental conservation be kept in balance, so that benefits of development are not negated by the costs of environmental damage.

The passing of the Environment Quality Act in 1974 and the establishment in 1975 of the Department of the Environment, presently within the Ministry of Science, Technology and the Environment preceded and facilitated the formulation of the national environmental policy under the Third Malaysia Plan.

The importance of environmental education has not been overlooked in the plan which states that the mass media and educational institutions will be used to stimulate awareness among the general public of the importance of environmental conservation and the social and economic rationale affecting decisions on environmental issues.

It has been recommended that environmental concepts should be integrated into the formal curriculum at all levels in order to provide the necessary knowledge, values and skills needed for pupils' participation

in devising simple solutions to problems in their immediate environment.

3.8.2 Curriculum for Environmental Education

In the Malaysian school curriculum, environmental education is not treated as a separate subject but environmental education concepts are infused into already existing subjects. The content organization at different levels is as follows[24]:

> As a response to the developmental needs of the country, the curriculum content has had to address itself to certain problems and needs as they are found in the physical, cultural and socio-economic environment.
>
> *Primary school level.* The primary science curriculum continues to concentrate on key concepts such as plants and how they adapt themselves to the environment, types and plants, life cycles and the economic importance of agriculture. Around these concepts an environmental awareness is expected to be built up.
>
> *Lower-secondary stage - Integrated Science.* The integrated science course breaks down the arbitary divisions of the natural sciences, stressing inter-relationships. It attempts to link science education with practical application and the use of environmental resource elements as well as the introduction of human concerns. Two of the issues that are discussed in the present science curriculum are effects of air pollution on man, and safety precautions in the home.
>
> *Upper-secondary stage.* Here a General Science syllabus subscribes to a similar kind of integration. It stresses understanding of basic scientific concepts in relation to the pupils' environment and the application to everyday situations. The General Science syllabus deals with such big issues as the difficult disposal of radioactive chemical waste, the relationship between smoking and lung cancer, and the threat to the nitrogen cycle posed by intensive farming.
>
> *The single-subject disciplines.* The Physics, Chemistry and Biology syllabuses, though specialized and academic, do emphasize understanding of scientific concepts in relation to the pupils' environment and the application of these concepts to everyday situations.
>
> Through both the General Science and Physics syllabuses, pupils are made to examine data on, for instance, the effects of atmospheric impurities on lungs, hydro-electric power, nuclear fission and fusion, pollution and depletion of natural resources. In the Physics syllabus, world energy sources, the circumstances of the energy shortage and its possible effects on our way of life, and the efficient use and conservation of energy are aspects of one big environmental issue that is being studied.

In the Chemistry syllabus some of the issues discussed are air pollution and the world's climatological changes, water pollution and its effects on plants and animals, and transportation of fuels and wastes. In the Biology syllabus several issues commonly incorporated are ways of meeting the energy needs of the world's expanding population, effects of sound and pollution brought about by the impact of industrialization on the health of man, food production through efficient agricultural practices, the need for change in eating habits, and control of urban sprawl.

3.8.3 Teacher Education

Increasing concern with environment-linked subjects has created a need for re-orienting teachers in-service and in pre-service teacher education programmes.

Pre-service Training

The teacher education syllabuses are based on the school syllabus. Hence, the teaching of environmental education concepts in the school syllabuses are dealt with in the teacher education curriculum in those subject areas. The possible inclusion of environmental education as a separate subject is being considered (see Appendix D).

In-service Training.

In-service sources conducted at the national and regional level are directed towards re-orienting teachers to give them the competencies to teach the new content. Techniques in teaching environment - related topics linked to real life situations are covered in these courses. A brief account of the different forms of in-service training is given below[24]:

Face-to-face
The in-service courses conducted by the Schools Division of the Ministry of Education are usually planned and carried out nationally or regionally. The objective of such courses is to show teachers the new approach to curriculum development and the method of teaching the new programme. These courses are conducted by staff trained by the Curriculum Development Centre, and in some instances with the use of local expertise. The methods used are face-to-face training in Social Studies and face-to-face and practicum in the Sciences. The system of training at the Curriculum Development Centre is to prepare a cadre of lecturers able to conduct in-service courses in their regions. The courses normally last one week, and cover a variety of topics such as teaching and learning techniques; questioning techniques; techniques for writing test-items; laboratory organization; techniques in teaching environment-related

topics linked to real-life situations; the rationale, aims and objectives of the new course; use of scientific terms in Bahasa Malaysia and techniques in conducting in-service courses.

Self-instruction
In the search for an efficient way of keeping the heads of schools and the teachers informed about population-related issues and problems, the Population Education Unit of the Curriculum Development Centre has embarked on a teacher-orientation programme using self-learning modules (SLEM). It has developed seven modules:

a) Population change - its determinants and consequences,
b) The population situation in the world and in Malaysia,
c) Population programmes in Malaysia,
d) Population and Environment,
e) Population and Resources,
f) Population and social services, and
g) Population and the Quality of Life.

The SLEM programme focuses on population concepts which are in the school syllabuses. The modules on 'Population and Environment' and 'Population and Resources' deal with effects on the environment of rapidly growing population, and the need for management and conservation of resources. Of special interest is the module on 'Population and Quality of Life'. The SLEM teacher-orientation programme is a school-based activity, with heads of schools serving as course managers. Each module is self-contained with the objectives clearly laid out. The modules are interrelated and learning activities can be carried out individually.

In-service training linked to community and national development
Agricultural science teachers have been trained by a mobile-in-service unit which is an extension of a project to train teachers at Temenggong Ibrahim Teachers College in Johor Baru, Malaysia. The mobile unit organizes and conducts workshops for trained teachers of agricultural science at district level during weekends, usually using a school as the course centre.

Innovative efforts at in-service training in science
The limited availability of research findings on how to teach science in the context of current environmental problems has been the main problem of developers of training programmes for science teachers. An in-service training session for Key Personnel held recently at the Curriculum Development Centre utilized a Research-Development-Training Model. The session was held at the Field Study Centre, Gombak. The participants had at their disposal the following habitats for study:

- a clean, undisturbed stream,
- a highly silted river,
- a primary forest, and
- a secondary or early successional forest.

It was proposed that the participants of the course be trained in assessing water quality and its effects on plant and animal life in water. Also to be studied were the accompanying effects of logging or road construction on changes in the flora and fauna. Data on the

selected physical and chemical parameters were related to the biological community that existed in the selected areas. Discussions from this study gave insights on the functioning of each habitat as well as the effects of man's activity on it.

3.9 Nepal

Nepal is faced with severe environmental problems and has come to realize the urgency of conserving nature and the environment and hence the country's efforts have been directed for total development which encompasses social, cultural, educational and environmental aspects.

3.9.1 National Policy on Environment and Environmental Education

The Government of Nepal has taken certain corrective measures to prevent the deterioration of environmental conditions e.g. Legislation has been passed relating to reforestation, soil and water conservation, and preservation of the cultural heritage and wild life. Several government departments are charged with environmental activities, e.g. Ministry of Forests, Department of Soil Conservation and Watershed Management, Department of Archeology, Department of National Parks and Wilflife Protection.

The Nepal National Committee for Man and the Biosphere carries out research projects on environmental problems.

The Ministry of Education is mainly responsible for introducing environmental education to the formal school system.

3.9.2 Curriculum for Environmental Education

Environmental Education is conducted in Nepal in both in-school and out-of-school programmes. It appears in various forms at all three levels of formal education.

Primary Level

The first level of education, grades I-V, is designed to prepare the child to understand and appreciate the importance of the environment. The following topics included in the primary curriculum are relevant to environmental education:

- geographical features of Nepal
- life and culture of the people
- ecological aspects
- homes and home gardens
- animals and pets
- preservation of nature
- use of natural resources
- adaptation of life to the environment
- comparing the life and environment of people in different parts of the country.

These topics are found in the Social Studies and Health and Sanitation subjects in the primary curriculum. Activities and field projects such as tree planting compaigns are also included.

Secondary Level (grades VI-X)

At the secondary level, environmental education is integrated into Science, Health and Social Studies curricula. As a part of the National Afforestation Programme, pupils are expected to take part in planting activities, as a part of the extra-curricular programme.

The following topics relevant to environmental education are found in the secondary curriculum:

- preservation of forests
- wild animals
- mountainous life
- cities, atmospheric pollution in cities
- ecology and natural resources
- interdependence of life
- cycles of nature
- population
- natural resources and their exploitation for economic benefit.

3.10 Sri Lanka

The importance and relevance of environmental education in the formal educational system was recognized only recently in Sri Lanka. However, there has always been some awareness of the value of the environment and the need for its conservation in the traditional value system of the rural people, particularly the rural farmers.

3.10.1 National Policy on Environment and Environmental Education

In the past, even though a national environmental policy had not been formally declared, some concern was shown in this direction as evidenced by the existence of legislation[25] to prevent pollution of the environment, for the protection of natural forest reserves and certain rare species of flora and fauna, and natural resources. Recently, the importance of the protection and improvement of the environment has gained constitutional recognition. The constitution of the Democratic Socialist Republic of Sri Lanka, Chapter VI, Article 27 (14), declares: "The State shall protect, preserve and improve the environment for the benefit of the community". In the same chapter, Article 28 (f) lays down a fundamental duty to all citizens: "To protect nature and conserve its riches".

The concern and awareness created by the rapidly aggravating environmental situation resulted in the formulation of a national environment policy and setting up of a Central Environment Authority[26].

The traditional curriculum of the formal school system did not contain any content or learning experiences of much significance in the area of environmental education. The science curriculum programme launched in the early sixties, probably for the first time, took notice of the importance of imparting certain aspects of knowledge, skills and attitudes pertaining to environmental education. This awareness was reflected particularly in the secondary school biology curriculum. A more deliberate and conscious effort was made in the national curriculum reforms in the early seventies

to introduce environmental education into the school curriculum in general education. This was attempted at different levels in the curriculum and using various strategies. It was not possible, for practical reasons, to introduce environmental studies as a separate subject in in its own right. Hence, the strategy adopted was to introduce concepts relevant to environmental studies through the appropriate subjects which were already in the curriculum, e.g., science, social studies. (The same approach, sometimes referred to as the 'infusion approach' was used to introduce the concepts of population education too).

The basic scientific concepts which formed the foundations of environmental education were introduced through the science curriculum and the socio-economic aspects through the social studies curriculum. An early awareness of, and experiences with the environment were provided in the new primary school integrated curriculum.

3.10.2 Curriculum for Environmental Education

The broad aim of the environmental education component in the general education curriculum is to develop an awareness and concern about the environment and problems associated with it, in the global sense in general, and with reference to the local situation in particular. It attempts further to provide the knowledge, skills, attitudes, motivation and commitment to take decisions and necessary action individually and collectively in matters relating to environmental problems and develop a sense of appreciation of the environment. An examination of the syllabuses and the teachers guides of the school curriculum reveal the following general objectives in the relevant subject areas:

- Knowledge and appreciation of the ecological balance and the quality of life, the constitution of the ecosphere, ecosystems, interaction of living and non-living things, interdepence of organisms

- Knowledge of the cycles of nature, the water cycle, carbon cycle, nitrogen cycle, etc.
- Knowledge of the energy flow through the ecosphere, energy transformations.
- Knowledge and appreciation of the carrying capacity of ecosystem to support population, the 'space ship concept' of the Earth.
- Awareness of the interaction of human society with nature, its effects on the ecosystem, cycles of nature, etc.
- Appreciation of the importance of the environment in economic, social and cultural development.
- Develop the ability to acquire, analyze, synthesize and apply the existing knowledge of the environment.
- Encourage the adoption of a life style conducive to a hamonious relationship with the environment.
- Be concerned about maintaining a 'clean' environment
- Develop the capacity for responsible and effective participation, individually and collectively in national programmes and activities concerned with the quality of the natural, social and cultural environment.

Topics, content and activities

Primary Education (Grades 0-5)

Environmental education is not an independent subject in the primary school curriculum but concepts and activities pertaining to the environment are included in one of the major study areas called Environmental Activities in the primary school integrated curriculum. This topic is given a high priority in the course which is second only to the basic language and mathematical skills areas. A considerable amount of coverage is given in the

curriculum to environment-oriented content under themes such as:

- Our homes and people who live in them
- What we eat and drink
- What we wear
- Things around us
- Means for our work
- Means for our transport and communications
- What we see and hear
- Our school and its surroundings
- Unity through diversity

The learning is not limited to the mere acquisition of factual information under the above themes. Learning takes place through pupil activities which are intended to provide, in addition to factual knowledge, opportunities for analytical and rational thinking, appreciation of the environment, value of life, living in harmony with the environment, etc. The syllabus is flexible and lends itself to be adapted to suit local conditions. This enables teachers and pupils to base their activities on real situations relevant to their immediate environment. Some examples of such activities actually carried out in schools are given below:

Example 1: An activity carried out in and around a weaving mill (Grade 4, Age 9+)

This activity was done under the theme - What we wear. It illustrates the flexibility of the curriculum specifications and shows the vast range and variety of learning experiences that can be brought in, especially in the field of environmental education.

A grade 4 class in a school close to one of the largest textile mills in the country carried out a project based on this textile mill. In addition to a study of the mill and the production of textiles, they became

interested in the environment around the mill and the effect of the mill on it.

They studied the waste water that leaves the factory into a nearby canal. One of the activities was a comparative study of the water taken from the town supply, factory waste water, water from the canal above and below the factory. They observed physical properties such as colour, temperature, turbidity and noted the pollution caused by the waste water of the mill. It was also revealed that no plants and fish could survive in the canal below the mill.

The pupils improvised a technique to compare samples of air in the factory and outside. Samples of air trapped in polythene bags were held against a beam of sunlight falling through a hole in a darkened room. This enabled them to get some idea of the air pollution caused by dust particles in the mill.

Example 2: An activity carried out on natural water sources and water pollution (Grade 1, Age 6+)

This activity was based on the theme - Water is an essential item in the home.

The teachers guide suggests the following questions and activities which can lead to further pupil investigations.

- What is the source of water in your home?
- What activities at home require water?
- How many buckets or pots of water do you require for a day?
- How do you prepare your drinking water?
- Keep a vessel of water undisturbed for a day or two and observe any changes.
- Can you explain these changes?
- etc.

A grade 1 class in a school situated near a tyre factory on the bank of a river, while doing the above investigations with water, noticed that some water samples contained black particles. Further investigations proved that the black particles were added to the river water from the factory waste water. The information was shared with the neighbouring schools and joint investigations were caried out to find out other sources of water pollution in the area and compare results.

Example 3: An activity on soil erosion in the school garden

(Grade III, Age 8+)

Under the theme - Our school and its neighbourhood - one of the main areas of study is the drainage and soil erosion of the school garden. The relevant section of the teachers guide is as follows:

Grade I

Concept: Flowing water carries small particles of matter.

Activities and questions leading to further investigations:

- Collect samples of water when it is raining, from
  a) an open place
  b) a gutter pipe of the roof
  c) a stream.

Leave them undisturbed for a day or two.

What changes do you see?

How can you account for them?

Grade III

Concept: Flowing water causes erosion and changes the landscape.

Activities and questions:

- Draw a map of the school compound and mark the waterways on a rainy day.
- Indicate the ones that carry much water.

- Mark the hills and slopes.
- Design a plan to control damage caused by erosion in your school garden.

Similar activities leading to environmental awareness are found in several other themes.

Secondary Education (Grades 6-10)

As mentioned earlier, content and learning experiences in environmental education are introduced in the secondary school curriculum not as a separate subject but through the already existing subjects - mainly science and social studies.

In the integrated science curriculum for grades 6-10, several units are devoted to environment education-oriented content. In the early grades, the basic science concepts on the atmosphere, the biosphere, water and the water cycle, the soil, plants, animals, the carbon cycle, the nitrogen cycle, energy transformation and the energy flow through the biosphere, the food chain, eco-systems and interdependence of life, interactions and agents of change, pollution, natural resources, etc., etc., are gradually built up. In the last few units of the course, a conscious and deliberate attempt is made to integrate these basic concepts and establish a deeper understanding of the effect of these various factors on the environment.

While the physical and scientific aspects of the content of environment education are introduced through the science curriculum, the socio-economic and political aspects are dealt with through the social studies curriculum. The following topics in the social studies curriculum have direct relevance to environmental studies:

- Our town (or village) - the physical environment
- Geography (both local and world)
- Growth, development and consumption, exploitation of natural resources for development, its effect on the environment

- Population, problems of population growth and its effects on the environment
- Social responsibilities of the individual
- Urbanization, industrialization, the use of modern technology and its effects on the environment.

In addition to the scientific and socio-economic treatment of environmental content, an attempt was made to develop a curriculum based on the aesthetic aspects of the environment. A pilot project on Appreciation of the Environment under the aesthetic group of subjects was carried out from 1976 - 78. The broad aim of this pilot project was to develop learning materials and train a group of teachers to inculcate in the minds of the pupils a sense of appreciation of the aesthetic value of nature - its colours, shapes, sounds, phenomena, movements, living and non-living things. This pilot project was tried out for about one and a half years. Attempts are now being made to revive it under a new project for developing an integrated aesthetic education curriculum.

Senior Secondary Level (Grades 11-12)

Topics related to environmental education are found in the science subjects, Botany, Chemistry and Zoology, e.g.,

Botany: Plants and their environment - ecosystems, soil, climate and natural vegetation of Sri Lanka, Man's influence on ecosystems - agricultural ecosystems, deforestation, human settlements, pollution.

Zoology: The animal kingdom (this study is based mainly on the animals in the immediate environment). Ecology - the major ecological realms of Sri Lanka, principles of conservation.

Chemistry: Natural chemical resources of Sri Lanka, non-renewable resources, their uses, chemical pollution.

3.10.3 Evaluation

Since the content of environmental education is introduced through several subjects in the school curriculum, the evaluation of this content is also incorporated into the general scheme of evaluation pertaining to those subjects. For example, the question papers in the GCE examinations in science and social studies contain questions related to environmental problems. No scheme has been devised so far to evaluate the extra-curricular component of environment related activities in a systematic manner.

3.10.4 Teacher Education

The teacher education programme in environmental education is still in its formative stage. At the primary level, the teacher education curriculum has been revised to include the teaching of the environmental education content in the primary school integrated curriculum. An optional minor course in environmental studies was introduced to the teachers college curriculum at one stage but it was discontinued because it was observed that there was much overlapping between the content of this course and the regular courses. It may be stated that all teacher-trainees following the primary education course are exposed to some content, learning experiences and methodology in environment education.

A similar situation may be said to exist at the secondary level too. While there is no special course in environmental studies, the relevant content is included in the science and social studies special courses. This means that only those teachers who specialize in the teaching of science and social studies gain some exposure to environmental studies whereas others such as language, vocational and aesthetic teachers do not have the benefit of such exposure.

In addition to the institutional pre-service programmes, in-service education programmes also cater to the emerging needs of teachers in the field of environment education.

It may be added that the population education programme also has much in common with the aims and objectives of environmental education. The teaching and learning materials, and in-service teacher education courses organised under the population education programme are a welcome supplement to the environmental education efforts.

3.10.5 Some Observations and Future Action

Considering the emerging trends in environmental education and the priority it demands, much needs to be done to expand and strengthen the environmental education programme in Sri Lanka. While maintaining the present policy of imparting education in this field at school level through the existing curriculum structure, the following suggestions are made for further development:

- Revision of the present curriculum specifications in primary education and in science and social studies at secondary level to make them conform more closely to the specific objectives of environment education. A more activity-oriented approach, dealing with real-life problems is desirable.
- Production of more resource materials giving accurate and up-to-date information and ideas for projects and investigations for teachers and pupils (including supplementary reading material for pupils).
- Revise and strengthen the teacher education programme to make it more effective in providing the necessary competencies to teachers for teaching the environmental education curriculum in schools.
- Link the school programmes more closely with community based activities to make the school curriculum in this field more relevant and meaningful.

- Encourage and support the founding of school clubs devoted to the conservation and appreciation of the environment.
- Develop methods and techniques for improving evaluation of pupils' learning, especially of the practical and extra-curricular component of environmental education, including attitudes and values.

3.11 Thailand

Even though the term 'environmental education' was not widely known, Thai schools have been imparting some elements of environmental education through their normal subjects without identifying it as such. It has now become a special area of interest along with other new concepts such as population education.

3.11.1 National Policy on Environment and Environmental Education

Statements incorporated into the Constitution of Thailand indicate national awareness and concern about environmental problems, e.g. under Section 65 of the Constitution of October 1974 it is stated that "the State shall maintain the balance of the environment and eliminate pollution that is damaging to public health". In 1975, the Improvement and Conservation of National Quality Act was promulgated and the National Environment Board (NEB) was established. The environmental development policy drawn up by the NEB comprises six chapters: General, Management of National Resources, Pollution Control, Population Distribution, Conservation of Nature and Environmental Education.

As a part of the combined effort to promote environmental quality, environmental educational activities have also been planned. In the Thailand National Educational Scheme 1977, it is stated under Section 6, Item 52 that "The State shall undertake to inculcate the awareness of the importance of conservation of natural resources and environment as well as population education".

3.11.2 Curriculum for Environmental Education

For the purpose of curriculum development, environmental education has been interpreted as "a learning process to create an awareness of the importance of conservation of material resources and the environment, and to induce responsible behaviour towards such conservation".

Objectives

The objectives of environmental education have been summed up in general as follows[27]:

a) To induce knowledge and understanding about environmental problems and their causes as well as ways to prevent or solve such problems on a personal as well as a social basis.
b) To create an understanding about the interrelationship between humans and their environment.
c) To induce an awareness of and interest in the environmental problems, both present and past.
d) To induce proper attitudes, values and a sense of responsibility towards conservation of the environment.
e) To demonstrate effective and economical utilization of natural resources.
f) To enable learners to make their own decisions properly and rationally in solving environmental problems.
g) To enable learners to utilize their knowledge about the environment in creating and improving the standard of living on a personal as well as a social basis.

Elementary (Primary) Level grades (I-VI)

The new elementary school curriculum, introduced in 1978, is no longer made up of separate subjects, but is divided into four integrated groups of experiences. They are, first, basic skills, which include language and computational skills; second, life experiences, which include social studies, environmental studies, health education, and others; third, character education, covering fields such as ethics, arts and physical education; and fourth, work experiences, providing some pre-vocational training and vocational orientation.

The new curriculum also has three basic orientations - for individual, local and community growth, and for national development. Environmental education can be integrated easily and effectively into such a curriculum especially in the second-life experiences-group. Contents relating to environmental concerns in the elementary school curriculum are listed according to grade as follows:

Grades	Topics
Grades I and II	1. How to clean the house 2. How to dispose of household garbage 3. How to help keep the school environment clean, beautiful and healthy 4. How to behave according to school rules and regulations 5. How to keep our community beautiful
Grades III and IV	1. Proper foods to eat for good health 2. How to use household medicines 3. Consequences of the destruction of plants and animals in our surroundings 4. Some laws and regulations concerning animal conservation, protected areas and national parks 5. How to keep our home clean, tidy and healthful 6. Conservation of natural resources such as the earth, water, air, and trees in Thailand
Grades V and VI	1. Foods to be avoided 2. Responsibilities as a member of a family and the community 3. Conservation methods concerning the earth, forests, and water 4. How to conserve natural resources in Thailand such as trees, minerals, animals, and water 5. Chemicals in our life such as medicine, insecticides, fertilizers, and detergent, and how to utilize them safely and properly

Secondary Level (grades VII-XII)

An integrated approach is adopted to environmental education combining it in the areas of social studies and science. Contents relating to environmental concerns in the lower secondary curriculum are as follows:

Grades	Subject area and topics
Grade VII	Science 1. How to prevent or overcome water pollution 2. Utilization and conservation of minerals 3. Relationship between humans and their environment Social Studies 4. Environmental conservation at the provincial level 5. Environmental effects on daily life on a regional basis 6. Roles and responsibilities towards the community 7. Regulations on the conservation of our surroundings

Grade	Subject area and topics
Grade VIII	Science 1. Soils and their conservation Social Studies 2. National conservation of natural resources: forest, animals, water, soil, air, minerals, populations and others 3. The role and responsibility of the individual 4. Regulations on the preservation of animals
Grade IX	Science 1. Effects of population increase on the environment 2. How to adapt the environment to the benefit of daily living 3. Causes of deterioration of the environment 4. Causes of water and air pollution and how to prevent them 5. Garbage and its disposal 6. Soil degradation 7. Effects of energy utilization 8. Preventive control of noise pollution 9. How to work toward a balance in nature
Elective courses	Humans and their environment - Population distribution and peoples' occupations as related to the environment: utilization of resources; environmental problems; environmental pollution; prevention and revision of laws concerning the environment. Thai society - Various social problems in Thailand and how to solve them: poverty; land holding for cultivation; illiteracy; crime; juvenile delinquency; drugs; traffic; migration; food deficiency; slums; strikes and national security.

At the upper secondary stage, environmental education is included in a manner similar to the lower secondary stage approach, both by integration in the subject areas and by elective courses in social studies.

Preparation of instructional materials

Instructional materials such as textbooks, teachers guides, teaching aids, source books and supplementary readers are prepared by the responsible agencies on a committee or individual assignment basis. Two examples of such projects appear below. (Private publishers are also allowed to develop textbooks which must be submitted to the Ministry of Education for approval before they can be used as textbooks in schools).

Project for preparing a source book on Conservation of Resources and the Environment for the first and second levels

The subject of Conservation of Resources and the Environment, part of the Social Studies, is taught as an elective subject at the lower-secondary level (grades VII-IX). In order to help teachers deal effectively with this new area of environmental education, and to achieve the goals identified in the curriculum, a workshop for the preparation of a teacher's manual was organized by the Population and Environmental unit of the Curriculum Development Centre.

The participants of the workshop were 15 representatives from lower-secondary schools, educational regions, the Curriculum Development Centre and other agencies concerned. The participants were divided into small groups to write the following units: (1) Principal and primary resolution of Conservation of Resources and the Environment; (2) List of references beneficial to teachers; (3) Examples of teaching units, methodology for selecting problems, how to set the issues and use audio-visual media; and (4) Appendix. After revision of the first version, the manuals were produced for distribution to schools.

Special features
The teacher's manual for Conservation of Resources and the Environment prepared under this project is different from its predecessor because it emphasizes the problem-solving approach to teaching. The manual includes various kinds of environmental problems students are likely to face; the teacher can select the problems in the manual considered to be the most important for the local community. Moreover, teachers are encouraged to raise other problems, which may not be covered in the manual but which match existing ones in the students' own locale, following the teaching and learning techniques in the manual as examples.

Project for preparing a source book on Conservation of Resources and the Environment for the First and Second Levels

Resources and Environment Conservation is a subject in the area of Life Experiences, taught at the primary level, and is an elective subject at lower-secondary level. At present, there is a lack of source books on the subject for teachers to acquire additional knowledge, and the Educational Materials Development Centre, (EMDC) is undertaking a programme to fill this gap. Objectives of the project are (a) to give all teachers supplementary knowledge on the conservation of resources and the environment; (b) to provide students and interested persons with basic knowledge relating to this subject; and (c) to promote knowledge, understanding and appreciation of education on resources and the environment among the people concerned.

The EMDC was asked to identify and appoint a group of qualified persons from the higher education institutes with experience and expertise in this field to write the manuscript in accordance with the curriculum. After the manuscript had been drafted, specialists were appointed by the Department of Educational Techniques to revise and edit the manuscript, and then recommend it for approval to the Ministry of Education.

Special features
The source book has many illustrations, various data of resource utilities and a list of wild animals protected by the 1975 Act, with both their common and scientific names.

At present there are available in the market several supplementary readers in environmental conservation for both the first and second levels, prepared by the Ministry of Education and private publishers. As we have seen, a teacher's guide in the teaching of environment and conservation of natural resources is now being tried out for the secondary level. In this useful manual, a number of teaching units are introduced as models for teachers. Each unit focuses on one existing environmental issue problem. Teachers are encouraged to select the units which concern issues on problems relevant to their localities, or to develop their own teaching unit using the model unit as a guideline.

3.11.3 Teacher Education

The position regarding teacher education is stated as follows[27]:

There is no special training for teachers of environmental education at the certificate level. In the pre-service teacher training programme elective, environmental science courses are offered under general science. Graduate training in environmental studies is provided at universities such as Kasetsart, which offers an M.Sc. programme in Environmental Science, and Mahidol University, which has two master's degree programmes. One of these is an M.Sc. in the Technology of Environmental Management, offered by the Faculty of Environment and Research Studies; the other is an M.Ed. in Environmental Education, offered by the Faculty of Science and Humanities.

For the elementary and lower-secondary levels no special training in environmental education and out-of-school education is considered necessary for teachers who are teaching this subject in an integrated form. The teacher's guide and some in-service training on the teaching/learning process are considered adequate at present.

In addition to the pre-service and in-service programmes for teachers, a teacher's manual and a source book for conservation of Resources and the Environment has been prepared to help teachers deal more effectively with the new content.

3.11.4 Future Directions

With the population increasing at the rate of over one million each year, leading to an expected doubling of the total population within the next 20 years or so, environmental problems which are closely related to population size have gained more and more attention from the government as well as the general public. In the out-of-school sector, the emphasis is on environmental problems due to detrimental effects of the development process. For in-school education, more

emphasis is expected to be put on the individual's interaction with his environment, and on responsible participation in community activities to preserve and improve environmental conditions.

A recent development which concerns environmental education is the recommendation proposed by participants of a Seminar on the Importance of Energy and Food Policy to National Survival, organized by Mahidol University in September 1980. The recommendation states that "The state must campaign vigoruously to make people realize the necessity of saving energy and food, utilizing all forms of education and mass communication...". If approved by the cabinet this recommendation will become the area to be emphasized in our future educational programmes.

3.12 The Union of Soviet Socialist Republics (USSR)

From the early years of the birth of the Soviet Union, Action has been taken at national level to protect the environment. Clause 18 of the Constitution of the USSR states[28]:

> In the interests of present and future generations the necessary measures are being taken in the USSR to ensure the conservation and scientifically founded rational utilization of land, its mineral resources, the plant and animal wealth, and the preservation of the purity of the air and water, thus ensuring the reproduction of natural resources and improvement of man's environment.

In recent years, laws on health and the national use and conservation of land and water resources, forest, the earth, animals and plants have been adopted.

Environmental education is considered as part of all general school education. Its main aim is to help pupils understand the scientific basis of correlations between society and nature. The roots of modern environmental education may be traced back to the traditional 'conservation education' and 'ecological education' whose interpretations have now been broadened to show their integral character, social trends and the necessity for an interdisciplinary approach. The principal coordinating body for environmental education is the All Union Environmental Education Section of the State Committees on Science and Technology.

3.12.2 Curriculum for Environmental Education

Since the territory of the USSR is vast and since the problems of

environment have a specific zonal and geographical character, the content of environmental education has to be developed on a regional basis taking into consideration the local conditions.

Objective and Scope

The objective of environmental education is to develop a system of scientific knowledge, attitudes and convictions that will give pupils a sense of responsibility for the environment.

Environmental education is concerned with both the natural sciences and the social and humanitarian problems that arise from society's interaction with nature.

An interdisciplinary approach has been adopted in introducing environmental education in the school curriculum. The topics of the interdisciplinary content in environmental education are distributed among various existing disciplines.

Primary School Level

At the primary level, education in nature care is provided for by a special section of the nursery school programme. At the general primary and lower secondary level, four environmental education components can be identified in the curriculum:

- systematic inculcation of knowledge about nature, society and rational use of natural resources;
- development of practical skills with regard to the protection of nature;
- activities such as tree planting, fish rearing, etc.;
- development of socially sound attitudes and behaviour with regard to the environment.

Secondary Level (Forms 1-10)

The basic content of environmental education presented through the various existing subjects is given below[28]:

Stage I (Forms 1-4)

- The composite elements of nature;
- An elementary understanding of the cause-and-effect links in nature, primarily in consideration of seasonal changes;
- An understanding of the interaction between plants and animals and the elements of inanimate nature;
- An accumulation of scientific facts on man's positive and negative influence on natural objects and the links between them;
- Man's economic activity in different seasons and his dependence on local natural conditions;
- A general idea of the economic significance of nature;
- Knowledge about measures to control pollution; and
- Evaluation of the popular experience in forming a reasonable attitude towards nature.

Stage II (Forms 5-7)

- Interdependence of phenomena in animate and inanimate nature;
- The first concepts of the conditions needed for life, of the medium in which organisms exist, and of their interrelations with other organisms and the environment;
- The influence of animate on inanimate nature;
- Introduction of the term biosphere;
- The study of scientific methods of preventing the undesirable influence of man's activities on links within nature;
- Historical facts, reflecting the growing role of natural resources as one of the sources of society's progress;
- Access to information on the economic development of different countries which depend on the exploitation of natural resources; and
- An analysis of information on nature conservation in the districts where the pupils live, and on the development of their economies in natural conditions.

Stage III (Forms 8-10)

- Understanding the universal character of interrelations between natural phenomena in their development;
- Learning the essence of the unity of society and nature;
- The concept of a natural medium, of the inter-connections between its components at various levels: molecule, cell-tissue, organism, population-species, and biosphere;
- Balance and imbalance in nature;
- Study of the biosphere, its structure, components and energy;
- The role of green plants;
- Evaluation of the interaction between society and nature, depending on the social and political structure;
- Learning scientific facts about man's impact on nature;
- Forms of pollution, permissible norms and measures to prevent it;
- The concept of environmental and social hygiene;
- Measures to conserve the gene pool;
- State and international measures on nature conservation and the use of natural resources;
- Ways of changing ecologically inefficient technology; and
- Creation of optimum conditions in the biosphere, and the concept of the ionosphere.

The system of interdisciplinary links is shown in the following table:

How environmental problems are studied in school subjects

Natural History (Forms 1-4): Natural environment factors. Natural wealth of home district. Seasonal changes and man's work in nature. Legislation. Careful use of natural resources.

Biology (Forms 5-10): Man's impact on natural interlinks (ecosystems, populations, biosphere). Role of animate nature in man's life. Hygienic aspect of nature. Plants. Balance and imbalance in nature.

Geography (Forms 5-10): Development and inter-connection of natural complexes. Economic activities and nature. Estimation of resources and their distribution. Planned use of nature in the Soviet Union.

Physics and Chemistry (Forms 9-10): Impact of modern production on nature. Recycling. Reclamation. Pollution control.

History, Social Sciences (Forms 4-10): Government actions on nature conservation. History of the nature conservation movement. The Communist Party and its programme on environmental management and nature conservation. Legal and moral norms governing the inter-relationship between man and nature. Civic responsibility for the fate of the environment. Regularities of the inter-connections between nature and society. Social environmental practices conditioned by historical factors. The USSR Constitution, as it relates to the necessity to regulate the management of natural resources and to nature conservation itself.

Literature and Art (Forms 1-10): The moral basis of links between man and nature. Nature depicted in art. The beauty of nature as a source of aesthetic feeling and the moral improvement of man.

Hand Work (Forms 1-10): Nature as a medium for man's work. Participation of school children in practical activities to improve the environment and reproduce natural wealth.

A summary of the content of the theoretical lessons and practical activities during field practice organized by the staff of the Institute for the Content and Methods of Teaching, a section of the USSR Academy of Pedagogical Sciences, is given in the following table:

Field practice organized for pupils by the Institute for the Content and Methods of Teaching

Type of activity	Content
Study of biological communities for the purpose of making an inventory of nature's wealth	Description of the types of plant communities. Study of the variety and inter-connections between the species, and of species of relicts and endemics. Peculiarities of the way of life of species (i.e., ants, birds, ungulate animals), structure of populations, dynamics of their numbers; study of the types of environment.

Table cont.:

Type of activity	Content
The art of finding one's bearings on the ground. Methods of scientific investigations	Finding one's bearings, using a compass and natural landmarks, walking along the azimuth, setting up experimental plots and making maps of them. Learning methods of systematizing species in nature. Keeping a journal, reports, essays.
Practical nature conservation activities	Study of the need for artificial nesting grounds in different types of forests. Building and hanging of the nests. Inspection and reports on the colonies. Repairs to and cleaning up the nesting grounds. Work on bird feeding tables. Care of the forest. Cleaning recreation areas and living sites.

Some schools provide optional courses in an attempt to extend modern ideas on nature conservation. They include both theoretical and practical studies under the following topics:

- Scientific basis of nature conservation movement, Atmospheric control, Water control, Soil use, Plants, Wildlife management, Mineral resources, Landscapes, Tourism and nature conservation.

In the final stage of general secondary education, students undergo a special integrated course called "Man and the Biosphere". The aim of this course is to bring together the various disjointed pieces of ecological knowledge which have been acquired through various subjects, and to use this knowledge to help solve national and global environmental problems.

The course consists of three themes:

- Knowledge of the Biosphere - the natural science basis for nature conservation.
- History of the Interaction between Nature and Society.
- Optimization of the Interaction between Nature and Society (nature conservation)

(see Appendix E)

3.12.3 Teacher Education

Even though there are no special teacher education courses in ecology, all teachers are given a training in the teaching of environmental concepts using an interdisciplinary approach. From the 1960's there have been Nature Conservation courses in teachers colleges. A compulsory course in environmental problems was started in 1970 in all teacher training institutions.

A system of post-graduate training in ecology is also used. Summer school in-service training courses are another type used for teacher training.

An ecological teacher training programme is described below[28]:

Ecological Teacher Training

Environmental problems are included in most of the disciplines taught to students of all institutes. The first time they come across the scale and significance of this sort of problem is when they take the course Introduction to the speciality in their first term.

The development of ecological knowledge is achieved not only by the interdisciplinary approach, but also by the spcial course Nature conservation, started in 1948 at the Biology Faculty of the Moscow State University and at the Tomsk State University. By the end of the 1970s, environmentologists with the following specialities had been trained at the tertiary level:

- rational utilization of water resources and rendering industrial sewage harmless;
- water supply, sewage and purification of industrial sewage;
- agricultural water supply, irrigation and protection of water resources;
- ichthyology and fish-breeding;
- forestry;
- use of gas and black oil and protection of the atmosphere for the speciality 'Industrial heat-power engineering';
- technology of the recuperation of secondary materials;
- hygiene sanitation and epidemiology;
- rational utiliztion of natural resources and environment protection for the specialities Biology and Geography;
- ecology, utilization of natural resources and development of their effectiveness.

Not long ago new specializations Architectural Ecology and Building Ecology were introduced in architectural institutes.

Absent from the list of school teacher professions is an Ecology specialization. This situation will not change greatly in the near future because of the decision to give environmental training to all

teachers to make a success of the interdisciplinary approach in environmental education at school level.

The course of Nature Conservation was introduced at a number of teacher-training institutes at the beginning of the 1960s. A compulsory course on environmental problems was started in 1970 at all teacher training institutes. Only a few students enrolled, mainly from faculties with specializations in Biology with Chemistry, Chemistry with Biology, Geography with a minor in Biology, Pre-school Pedagogy, and Pedagogy and Methods of Primary Education. Thus, only biology, geography, chemistry and primary school teachers are specially trained in this field.

Practice teaching is considered one of the most important aspects in ecological teacher training. Though beginning students in this subject may have theoretical and even practical knowledge, they still cannot use it according to the objectives of ecological education at school. This means that the ability to use knowledge depends not on its extent but on its accuracy, systematic character and mobility. The mobility and ability to control and adjust knowledge within the school programme enables students to carry out ecological education effectively at school. It is noteworthy that practice teaching changes students' attitudes towards their studies. After they have tried in practice to use their vocational knowledge, they begin to understand that their special training needs some improvement.

To improve the ecological training of teachers and Environmental Education at school the All-Union Minsk Conference (1979) recommended the introduction of a compulsory course of ecological education for students in all faculties at teacher-training institutes. At the Tomsk teacher-training institute and some others, such a course has been taken by all students for a number of years.

A system of post-graduate training in ecology is also used. In Estonia in 1968, for example, the Nature Conservation Society in co-operation with the Estonian Ministry of Education introduced a new type of summer school training for ecological teacher-training. All teachers - including primary school teachers - and headmasters attend for two weeks. Of 100 periods, ten are allocated for lectures and the rest for field practice. Similar summer courses at some of the nature reserves are organized by the institutes of post-graduate teacher-training in Moscow, Vilnius, and other cities.

3.12.4 Observations and Future Developments

Taking into consideration the wide range of environmental education problems, and the fact that many ministries, educational institutions, scientific departments, public organizations, mass media and others are involved in environmental education, the coordination of these activities becomes an important task.

The First All-Union Conference on Environmental Education, Minsk

1979 made an analysis of already existing materials and previous experiences and gave the following directions for compiling and implementing environmental education syllabuses and programmes:

- the plurality of Environmental Education objectives;
- the interrelation and continuity of Environmental Education; each member of a society must have the opportunity to acquire and extend his environmental knowledge;
- co-ordination of the general and individual; the development of the general ecological culture of the people should be co-ordinated with specific local needs and priorities;
- stimulation of the environmental activity of each citizen; and
- the implementation of Environmental Education programmes which should take into account forecasts of the extent of exploitation of natural resources.

3.13 Venezuela

Traditionally, environmental education in Venezuela was associated with the teaching of conservation. With the beginning of the industrial development and the population concentration in cities, environmental problems became severe and a revision of the concept and strategies of environmental education was required.

3.13.1 National Policy on Environmental Education

In 1977 the Ministry of Environment and Natural Renewable Resources (MARNR) was established. It has among others, the following functions:

- to formulate the national environmental policy
- to establish the national environmental plan
- to establish, coordinate, supervise and guide the programmes for environmental education.

The environmental policy is oriented towards the elimination of the main environmental conflicts such as irrational use of land, imbalance between urban and rural systems, irrational exploitation of resources, utilization of environment degrading technology, lack of environmental education and low civic participation. In 1981, the Ministry of Environment established the Office of Environmental Education, Professional Development

and International Relations (ODEPRI) composed of three units, one of which was the Environmental Education unit. Through the Department of Environmental Education, the Ministry of Environment has prepared a National Programme for Environmental Education.

The National Programme for Environmental Education, is framed within the general strategy of national development and the environmental policies and strategies considered in the VIth National Plan and strengthened in the Organic Law of Environment, the Organic Law of Education and the Organic Law of Territorial Ordering.

Three broad objectives for Environmental Education have been established[29]:

- the education of the people on environmental problems in his community
- the search for a society where the economic and social development, the nature remain in a harmonious relation
- creation of an integral conception of the environment where an interrelationship of natural and social elements exists.

Based on the above objectives, the Division of support for the educational system of the Department of Environmental Education is responsible for the task - "to modify the environmental behaviour of the Venezuelan people by the introduction in the educational system of the environmental elements capable of promoting an environmental and conservation consciousness through educational and dissemination action"[30].

3.13.2 Curriculum for Environmental Education

In pursuance of the objectives mentioned above, environmental education is viewed as an integral education which will not be presented as a separate discipline but as the result of the orientation and articulation of the various disciplines and educational experiences that should facilitate

an integral perception of the environment and carrying out more rational actions corresponding to the social needs of the community. Environmental education is defined as "the process through which man will be capable of acquiring knowledge and experiences, understand them, internalize them and reflect them in behaviours which include attitudes and values leading to a better interaction with the environment"[31].

The essential characteristics of environmental education for pre-school and basic education levels are presented below.

Pre-School Level

Activities and content related to the environment were incorporated into the pre-school curriculum. Through a project launched by ODEPRI in 1982 in cooperation with the Ministry of Education. The aim of in-corporating an environmental approach in the pre-school curriculum was "to integrate the child to his immediate environment in order to ensure from the early years the development of a future citizen who shall be able to help in introducing the desirable social transformations"[32].

Content

The content is selected following the organizing principle of "Integrative Environmental Experience" (IEE) which is described as a real learning situation in which multiple interactions with the environment are established through which the child develops in a total manner acquiring knowledge, values and behaviour in relation to the needs of his environment.

An Example of an IEE

Activity:	A visit to the public square
Objective 1:	To discover the environmental components in the square
Content:	Environmental Components
	a) Natural - animals, plants, people, soil, water, air
	b) Social - health, housing.

Experiences:
- Observing environmental components
- discussing with others the components they liked
- collecting material (leaves, seeds, rocks, bottles, cans, etc.)
- expressing their experiences in oral and dramatized forms

Objective 2: To describe the characteristics of one or two components of the square

Content: Characteristics in relation to the size, amount, colour volume, for texture, etc.

Experiences:
- selecting one or two components
- naming the characteristics of the selected components
- establishing similarities and differences between them
- classifying the components
- identifying damages done and causes of the damage
- discussing ways of improving the square
- participation in simple activities for improvement of square.

Basic Education Level

The Basic Education curriculum is divided into six areas, for each of which particular objectives related to the environment have been suggested.

1. Language Area
   - to facilitate the development of abilities for reading and writing employing textual materials related to the environment
   - to contribute to the appraisal of national environmental problems by means of interpreting information given through the mass media

2. Natural sciences and Mathematics Area

- to understand and internalize environmental phenomena from a global and interdisciplinary point of view through the disciplines of the natural sciences
- to use mathematics as a means for creating a way of thinking oriented to view the natural and social dimensions of the environment

3. Thinking and Social Action Area

- to value the historical knowledge as a fundamental background for the analyses of environmental situations in the perspectives of the past, the present and the future
- to promote community participation in preserving the environment and solving environmental problems by fostering co-operative activities in the locality

4. Health, Physical Education and Recreation Area

- to guide the analyses of the environmental resources of the community for physical development, health and recreation
- to contribute to highlight the importance of parks and other natural environments for recreational and physical development activities

5. Aesthetic Education Area

- to promote artistic expressions by representing the natural environment and human behaviour in relation with the environment
- to guide the utilization of natural elements in creating artistic productions

6. Training for Work Area

- to facilitate understanding of the characteristics of the environment and of the intervening factors in productive activities as

well as their incidence in the preservation or destruction of the environment

- to guide reflection and development of attitudes and values associated with work, as a means for personal realization and as a contribution to progress, intertwined with social life and preservation of the natural resources.

The content of environmental education is specified in a text book prepared by the Department of Environmental Education for primary school teachers and pupils of the first years of the middle school.

Name of Textbook: "Naturaleza y Futuro"

Content:

Chapter I — The soil and its exploitation
- Soil as a natural Resource
- Soil and its relationship with other natural resources
- Soil as a resource in Venezuela
- Management and rational use of this resource

Chapter II — Plants, Animals and their Utility
- Plants and animals as natural resources
- Relationships and dependence of plants and animals with other natural resources
- Characteristics of this resource in Venezuela
- Management and rational use of this resource
- Adequate management of flora - adequate management of fauna

Chapter III — The Atmosphere
- The atmosphere as a physical system

Gases in the atmosphere

Structure and movements of the atmosphere

The atmosphere and its relationship with other natural resources

- The atmosphere, plants and animals
  " " and soil
  " " and water
  " " as a resource for man
- The weather and the climate
  Koeppen's Climatological system
  Thornthwaite's " "
- Meteorology and climatology in Venezuela
  Venezuela and the analysis of its main meteorological parameters
  Climatology in Venezuela
- Problems of air pollution in Venezuela

Chapter IV The hydrosphere

- The hydrosphere as a physical system
- Hydrological cycle
  Superficial waters
  Underground waters
- Water and its relationship with man, animals, plants and the soil
  Water as a resource for man
  Water and the animals
  Water and the plants
  Water and the soil

Chapter V World environmental problems

- Risks due to man

Geological alterations and the superficial soil

Alterations due to environmental pollution

Biotic alterations

- Social risks
- Natural risks
- Programmes and actions at a world wide level for the conservation of natural resources

Convention for the conservation of humid zones

Convention for the conservation of the world inheritance

Convention for the control of international commerce of species of wild fauna and flora

Convention for the conservation of migratory species of wild animals

Programme for the conservation of tropical forests

Programme for the conservation of arid zones

Global programme for protection of zones that are rich in genetic resources (species and eco-systems of exceptional variety)

The common universal inheritance

Conservation of hydrographic basins and international seas

Chapter VI Environmental Problems in Latin America

- Latin America. The exploitation of its natural resources and international relationships
- Development and planning in Latin America
- Effects of planning on environment

Effects of the practice of agriculture

Effects of industries

Effects of transportation

Effects of human settlements

Effects of development on river basins

Chapter VI Venezuela and the environmental crisis

- Background of the development model in Venezuela
- Venezuelan reality
  - Political and administrative reality
  - Physical and spatial reality
  - Socio-economic reality
- Environmental problems in Venezuela
  - Water pollution
  - Floods
  - Soil erosion
  - The problem of solid residues
  - Atmospheric pollution
  - Fires
  - Extinction of wild fauna.

3.13.3 Evaluation

For the evaluation of the environmental education content, the normal evaluation procedures adopted for the basic education level are used. Each learning situation is evaluated using diagnostic, formative and summative tests.

3.13.4 Teacher Education

Two national workshops were held in 1982 and 1983 to consider the teacher education programmes in environmental education. Some of the aims, conclusions, content and methodological strategies identified in those workshops are as follows:

Aims: To provide methodological guidelines for environmental education through specific situations that will permit the introduction by the teachers of the environmental approach in the teaching-learning process and to relate it with curriculum planning and development in basic education.

Conclusions:

- Environmental educations should be considered as an integrative, interdisciplinary axis, and should be included in all training components (general, professional, specialized), in such a manner that it fulfills the objectives of each component.
- In selecting objectives in environmental education the following general views should be taken into account, after considering the training component, and the modality or educational level in which they will be applied:
- Objectives should be integral, multi-, inter- or transdisciplinary in character. They should be organized in such manner that a critical attitude towards the environment is attained including affective, psychomotor and cognitive aspects.
- Objectives should be directed towards the development of participatory individuals and collectives, responsible for their actions and capable of finding solutions for the environmental problems of communities.
- Objectives should take into account the reality composed by man-nature-society, bearing in mind the attainment of a better quality of life.
- Objectives should focus on local, regional, national, world-wide environmental problems, taking into account the participants interests.

- Objectives should permit a total perception of the environment, where the parts are interdependent.

Similarly, suggestions were made about the contents of learning and evaluation activities.

All the suggestions have been considered by the participant institutions, which have started to try-out alternatives to introduce environmental education in their curricula. In the Second Workshop such experiences were examined and were presented in detail in the Final Report on the Workshop.

From them, some examples of objectives and contents, methodological strategies and evaluation are presented:

Objectives:

- To favour a deep "conscientization" about the causes of the problems and their impact on men and society and to try to attain the adoption of an ethical code and the individual and collective attitudes as well as behaviour patterns which contribute to protect and improve the environment in daily life, at work and in development activities.
- To analyze the ecological, philosophical, political, legal, economic, technological and social implications of man-environment interaction departing from concrete problems.
- To express value judgements directed to solve environmental problems from a global and multidisciplinary conception.
- To analyze the role of education and of the teacher in developing an environmental consciousness.
- To acquire the necessary skills for the detection and solution of environmental problems together with their pupils.

Contents:

- Ecosystems: Communities, Relations of man with nature
- Population: dynamics and social dimension

- Energy flow and materials cycle
- Limits in environmental factors
- Ordering and homeostasis
- Production and consumption
- Philosophical basis of the environmental crisis
- Modes of human life, national identity
- Problems of environmental education
- Economic development. Agro-industrial and social aspects. Development models
- Use, handling manipulation and administration of natural resources
- Impact of the production activities on the urbanistic and recreational processes
- Nutrition and health of Venezuelan people
- Venezuelan legal dispositions and the environmental crisis
- Role of education in environmental problems
- Local, regional, national and international level environmental problems
- Techniques for promotion. Community participation in the solution of environmental problems.

Methodological Strategies

These are framed within an active learning conception, which fosters the search, inquiry, reflection, creation and cultivation of a rational capability for investigation, application of knowledge, problem solving and process evaluation. Group discussions, field work, report and monographic presentation, role playing, forums, seminars, workshops, study groups, panels, projects, and consultancies are suggested.

In-Service teacher training

Another strategy intended to help the teacher is in-service training for which, among other actions, a Distance Training Course on Environmental Education has been designed. It will be developed through television programmes and a book which has been tried-out on a sample of teachers. It will cover, in the first stage, 10 000 teachers over the whole nation.

General Objective of the Course

To provide methodological guidelines for Environmental Education through specific situations that will permit the introduction by the teacher of the environmental approach in the teaching-learning process and to relate it with curriculum planning and development in Basic Education.

Another important element of the Distance Education Course is the "Study and Work Instrument" with which information is gathered about the understanding gained by each participant of the proposed methodology for the study of environmental situations. A series of activities are proposed through which the participants should: identify the elements of the environment and establish the relations between them; design activities related to the environmental problems detected with the "Questionnaire for the Appraisal of the Quality of the Environment"; establish the relations with the various programme areas in Basic Education; and apply the principles of environmental education.

Support Materials

The following materials facilitate holding the course:

a) Printed Material: "Nature and Future". It contains the following topics: Knowledge of the environment and the natural resources; characteristics and utilization of the natural resources in Venezuela; environmental crisis at regional, national and world-wide levels. It also includes a glossary of terms and a specialized bibliography about the themes.

b) Audio-Visual Materials: A television programme: "The Concerned Man". It presents situations from which environmental problems may be extracted and gives ideas for their solution.

3.13.5 Future Actions

Taking into account the broad field of environmental education, the environmental crisis facing the country and the individual and social needs in this area, much has still to be done in the formal educational system, as well as through less systematic and conventional ways.

In connection with the introduction of environmental education in the curriculum at the different educational levels the following are foreseen actions:

- Renewing the traditional approach of research on environmental matters, proposing a kind of participatory research in which the community studies its reality, faces its situation, assumes its responsibility, makes decisions and acts to solve its problems.
- Getting involved in the solution of local problems, in problem identification and its causes and effects, formulation and evaluation of possible solutions and elaboration of a plan for action.
- Insistence in joint work of school, family and community.
- Continuous development and evaluation of environmental programmes in Pre-school and Basic Education for which evaluation and dissemination of the current experiences are needed.
- More coordination of the institutional actions related to environmental education for which creating an office for Environmental Education within the structure of the General Direction of Planning and Budget of the Ministry of Education is suggested, in order to coordinate the educational environmental policy in the Ministry in

joint action with the office of the MARNR.

- Extention of the environmental approach up to Medium Diversified Education.
- Compulsory inclusion of the environmental approach in all teacher training programmes.
- Extension of the coverage of the Distance Education Course for teachers and development of new courses of this type.
- Introduction of the environmental approach in the school text-books through a joint work of the Ministry of Education with the editorial enterprises.

4. SURVEY OF ENVIRONMENTAL EDUCATION TRENDS

A researcher attempting to conduct a survey on trends in environmental education in the school curriculum, particularly in developing countries, is confronted with the problem of having to deal with a curriculum area which is relatively new and not well defined. It is observed that under the general umbrella of environmental education one would come across a wide spectrum of content and learning experiences, sometimes very remotely connected with the objectives of environmental education, nevertheless having some claim to be included under it due to the fact that this concept is complex, flexible and continously expanding to incorporate within it aspects of many traditional disciplines in the school curriculum. Further, the elements related to environmental concepts are so diffused and scattered in the curriculum that their identification becomes difficult. Due to these factors, there is no easy and clear-cut source of information about the exact status of environmental education in the school curricula of most countries.

4.1 National Policy on the Environment and Environmental Education

The declaration of national policy statements on the environment and environmental education is of recent origin and appears to be a result of the impact of international conferences such as the Stockholm and Tbilisi Conferences. However, certain types of acts and laws for the protection of fauna and flora, waterways, sea coasts, etc. have existed in some countries for a long period. The legislative measures which covered only some limited aspects of environmental problems have now been revised and strengthened and all the countries considered in this survey were found to have formal legislative enactments and policy declarations on the protection and improvement of the environment. Some countries have even embodied such policy statements in their national Constitutions (e.g. Colombia, Thailand, Sri Lanka, USSR, Venezuela). A wide range is observed in these legistative

measures - from prevention of pollution, conservation of wildlife, safety measures in industry and agriculture to the preservation of the national cultural heritage. In addition to legislation, many countries have set up special bodies such as Ministries, Authorities, Commissions and Boards to accept responsibility for national level activities, e.g.

Colombia	-	National Institute for Development of Natural Resources (INDERENA)
	-	National Consulting Committee for Ecology in Environmental Education
India	-	National Committee on Environmental Planning and Coordination
	-	Environmental Boards at State level
	-	Department of Environment
Japan	-	The Environment Agency
Federal Republic of Germany	-	Unesco Liasion Office for Environmental Education
Malaysia	-	Department of Environment, Ministry of Science, Technology and the Environment
Sri Lanka	-	Central Environment Authority
Thailand	-	National Environment Board
USSR	-	All Union Environmental Education Section of the State Committee on Science and Technology
Venezuela	-	Department of Environmental Education, Ministry of Environment and Natural Renewable Resources (MARMR)

Policy guidelines for environmental education are being given either by the special authorities responsible for the overall environment programmes, or by the Ministries in charge of school education. Since environmental education forms a part of the general education programme at school level, the legal bases of such education and its organizational pattern at national levels conform to those applicable for the national school educational system.

4.2 The Environmental Education Curriculum

Environmental education in the formal sense in which it is understood today is a recent innovation which has been introduced into the school curriculum since the 1960s. However, the traditional school curricula in most countries considered in the survey have had some objectives and content relevant to environmental education included in some subjects though not specifically mentioned under that name, e.g. Nature Study, Rural Science, Health (Hygiene), Geography, Ecology. Even though the content and treatment of these subjects did not measure up to the objectives and standards of the present day environmental education teaching, they provided a useful base for the development of environmental education as it is conceived today. In addition to the above common pattern, certain countries have made conscious efforts to base the educational experiences of the child directly on his immediate environment and evolve content and learning experiences which would be mutually beneficial both to the child and the environment. The Ghandhian concept of Basic Education in India may be cited as an example of such an attempt.

An examination of the aims, objectives, content and instructional methodology of the environmental education curriculum materials of the countries included in the study reveals certain common features such as the following:

- environmental education concepts are integrated into the entire system of education at all levels of the educational system, from primary school to the senior secondary school level (in some countries, e.g. Venezuela even at the pre-school level)
- an interdisciplinary approach is adopted at the primary level
- a multidisciplinary approach is adopted at the secondary level
- a holistic perspective encompassing the physical, ecological, social, cultural and other aspects of the problem is adopted
- in addition to the knowledge component (cognitive domain), the need to include skills (psycho-motor domain) and attitudes and values (affective domain) is also recognized.

A significant observation that is made is that all the countries have adopted the strategy of "infusing" subject matter relative to the environment into the different disciplines of the traditional curriculum in their attempt to integrate the environmental dimension with the general education curriculum. This has resulted in the emergence of a multidisciplinary approach which is evident particularly at the post-primary levels. Of the traditional subjects, natural and social sciences have had the benefit of absorbing the largest share of environmental concepts in this infusion approach.

Primary School Level

It is evident that much emphasis is usually placed - and quite correctly too - in introducing the environmental dimension to the primary school curriculum. Since the early sixties, most countries have revised their primary school curricula from the traditional subject centred didactic approach, to a more child-centred and activity oriented, integrated or semi - integrated approach. This new approach has adopted the educationally sound strategy of basing the content and learning experiences on the immediate environment of the child or learning through and from the environment. Consciously or unconsciously, this strategy had added another important advantage to the many other advantages of an integrated curriculum by making it flexible and lending itself very readily to the incorporation of the third environmental dimension (learning for the environment) to the curriculum.

Some primary curricula include special teaching units which contain topics around which environmental education concepts are developed, e.g.

India - Environmental Studies

Topics - Our Home, Our Nieghbourhood, Our Earth, etc.

Sri Lanka - Environmental Studies

Topics - Things around us, Our school and its neighbourhood, Our Earth and its surrounding, etc.

Thailand - Life Experiences

Topics - How to help keep the school environment clean, beautiful and healthy

USSR - Natural History

Topics - Natural environment factors, natural wealth of home district, seasonal changes and man's work in nature, careful use of natural resources

The flexibility of the approach also encourages teachers and pupils to carry out in-school and out-of-school projects related to the environment. Some of the activities in these projects cover a wide range of teaching objectives in several subjects such as language, science and mathematics (e.g. Sri Lanka - see activities under primary education). Similar projects providing direct experiences and problem solving skills have also been cited under Japan and Venezuela. Thes projects and activities provide the young children with structured learning situations where they interact with the physical, biological as well as the socio-cultural environment. There seems to be a general agreement, in the curricula of the countries included in the survey, on the aims and objectives of environmental education at the primary level. In most countries, the aims and objectives appear to have been influenced by, and conform to the guidelines and recommendations stated by the international conferences and workshops held during the previous years. These aims and objectives focus on learning by doing, exploratory activities by the learner and a variety of other imaginative modes of learning designed to reflect a concern with and for the environment.

An analysis of the content reveals that an attempt has been made to use the immediate environment of the child as the main source of teaching and learning. Common environment oriented topics such as water, air, the soil, how the air, water and the surroundings are polluted, rain, soil erosion, forests and trees, conservation of forest, plants and animals, etc. are found in the curricula of all countries. Community

oriented activities such as tree planting, sanitation work, recycling projects are also built into most curricula. It may be concluded that the attempt by many countries to achieve a measure of interdisciplinarity in the introduction of environmental concepts to the primary level curriculum has met with considerable success.

Some countries still have subject-based curricula at primary level, e.g. Japan, Colombia, Venezuela. In such countries, the environmental concepts are usually found in the general science (or natural science), social studies and health curricula.

Secondary Education

The content of environmental education in the school curriculum is found to have some of the characteristics discussed below.

a. Unlike in the traditional subjects where the content is ordered to conform to a well defined structure of a particular discipline, much of the content of environmental education is often seen to be problem centred. An examination of the syllabuses indicated that problems of a global nature as well as those of national and local concern provide the criteria for selection of content, e.g.

   - depletion of national forest coverage (Malaysia)
   - danger to wild life (Kenya)
   - problems of desertification (Kuwait)
   - industrial pollution (Japan)
   - depletion of natural resources (global)

b. The environmental education component is value-oriented unlike the content of traditional subjects which attempt to maintain a neutral position when dealing with controversial issues. Since the aim of environmental education is to develop a concern and motivation to take appropriate action to protect and improve the environment, a non-controversial set of acceptable values have been evolved which become evident in the curriculum of all countries, e.g.

   - adaption of life styles more conducive to the conservation of natural resources
   - need for population control
   - value of a clean and healthy environment

- need to strike a balance between development and environment exploitation

- individual responsibility for environmental welfare

c. Environmental Education is not considered solely as an in-school activity; it is essentially community oriented in all its aspects. The content and the learning experiences are based on materials and needs of the community. Also, the learning activities flow out beyond the boundaries of the school and the classroom to the community in which teachers, pupils, parents and the general public particiate.

d. Many of the traditional disciplines in the general education curriculum are mainly concerned with academic exercises whereas environmental education is an educational field which is concerned with the survival of human civilization and of man as a species. The "Space-ship Earth" concept is being developed in most curricula in relation to this characteristic of environmental education. The factors threatening man's survial, as well as remedial action to avert this threat form the focus of the curricula in some countries.

e. Environmental education is an educational area which lends itself to a variety of student initiated activities and involvements dealing with real-life problems. This possibility has added a new dimension to the experimental and investigatory components of subjects such as science and social studies, making such experimental work and investigations more meaningful and relevant to life, e.g.

- instead of carrying out an artificially created experiment in the science laboratory to determine the dissolved oxygen content of water, samples of polluted water from a river or a pound in the neighbourhood are analysed (Japan, Sri Lanka)

Examples of long term involvements by teachers and pupils in environment based activities are also found, e.g.

- growing a forest and observing the ecological changes (Japan)

- participating in environmental protection and development activities (many countries)

f. The contents of most traditional subjects are static and often out-dated. They deal with knowledge accumulated in the past and dealing with the past; rarely do they have anything significant which is relevant to the present or the future. But the environmental education content included in the curricula under review are of a dynamic nature, dealing with present and future oriented problems and issues. This feature has widened the scope of subjects such as Science ans Social Studies, and brought in fresh content and activities more relevant and oriented to the present and the future.

The introduction of the environmental dimension to the secondary level curriculum is found to be carried out through a variety of procedures. All

these procedures could be envisaged to fall into varying degrees of two approaches - the interdisciplinary approach and the multidisciplinary approach. These procedures range from the superimposition of environmental education as a separate subject on those already found in the curriculum to the total integration of environmental concepts into the content of existing subjects.

Environmental Studies as a Special Subject

The content dealing with the knowledge, skills and attitudes identified as being relevant to the achievement of the aims and objectives of environmental education can be assembled and structured to form a special subject in its own right. This method has several advantages as well as disadvantages.

One important advantage is that the unity and cohesion of environmental education could be ensured when it is given an individual status along with the other standard subjects like science and mathematics. This also appears to be the easiest method of introducing the subjects to the school curriculum. Also, when it occupies a special place as an independent subject in its own right, it will lend itself to serious and indepth study than when it is integrated with other subjects. The main disadvantages are firstly, it would be taken as 'just another subject' in the curriculum to be studied to satisfy examination requirements, thereby vitiating the purpose for which it was introduced; secondly, it would overload the already overcrowded school curriculum and would probably end up as an optional subject. However, such a single subject would be a truly 'interdisciplinary' subject, with content from a variety of other subject areas such as physical science, natural science, social sciences, and aesthetics. Another practical difficulty would be the availability of teachers who are capable of teaching such an interdisciplinary subject. In the present study no country was found to adopt this method totally, The USSR, Colombia and Venezuela have developed such

courses but implemented on a special and limited scale. In the USSR this subject forms a part of the curriculum only of the students completing their secondary education. It is also being tried out in certain educational districts in Colombia.

Infusion of Environmental Education Concepts into Existing Subjects

The dominant trend appears to be to 'infuse' content relevant to various environmental problems and issues into the exisiting subjects of the curriculum. This approach has been adopted by almost all the countries in the study andinfusion has been mainly to science and social studies.

Some environmental education concepts appear to a lesser extent in subjects such as Home Science, Health and Aesthetics. It should be stressed that this infusion is not confined to the inclusion of one or two special topics on the environment in the traditional Science or Social Studies Courses. It is a much more intense and integrated approach where subject areas closely related to the environmental concepts are re-structured to incorporate environmental content which is not normally found in such subjects, e.g. Science:

- The concepts of photosynthesis, cycles of nature, food webs, ecology, etc. are treated in a wider context, making them more meaningful to real environmental problems.

- The social and environmental implications of the development of science and technology are emphasized.

Social Studies:

- Units on natural resources of the countries, population, industrialization, urbanization, etc. are developed in an environment-oriented style.

- The environmental dimension is emphasized in units on national development and responsibilities of citizens in national efforts.

This strategy of infusing environmental concepts into the existing subjects and using them as carriers of environmental education is in effect a combination of the interdisciplinary and multidisciplinary approaches. In this strategy the content which is presented through any

given subject would not be confined stricly to that subject in the conventional sense but would encompass content which could be identified with one or more subjects. For example, when the topic 'pollution' is treated in science, the content will be drawn from several subjects such as chemistry, physics, biology, geography, health, etc. and to that extent, the content is interdisciplinary. Another topic, e.g. population may be presented through social studies. Since the interdisciplinary content of environmental education is infused into and presented through several subjects, the approach adopted to disseminate the content is multidisciplinary. Many countries have done a complete revision and reorganization of their curricula in order to adopt the above approach for introducing environmental education to their school curriculum. The introduction of new subjects such as social studies and integrated science into secondary school curricula has, in fact, facilitated this inderdisciplinary approach. A study of the integrated science curricula of many countries shows that those curricula have been designed to achieve much wider objectives than those attempted when science was taught separately as chemistry, physics and biology. Hence the integration of content to develop environmental concepts is more easily achieved in integrated science than in chemistry, physics and biology. Similarly, social studies provides better opportunities for developing the social aspects of environmental studies than geography, history and civics taken as separate subjects.

The incorporation of environmental concepts to these subjects has added a new dimension to them. This innovation has brought about a restructuring of scientific investigations away from a 'disciplinary' approach towards a total systems approach regarding a given situation, and brought in content and activities to make them more relevant to current problems and ensure a high degree of active learner partici-

pation. Many examples illustrating this feature are found in the curricula of most countries, particularly in the social studies and integrated science curricula.

Special Units on Environmental Studies in the Existing Subjects

This approach is different from the one described above because in this case the environmental content is not fully integrated into the various units of the subject but is added as separate, independent units, e.g. environment as a special unit or units in biology, chemistry, geography, etc. Such units are not interdisciplinary to any significant extent but are generally confined to that particular discipline. For instance, the unit, "Mineral desposits of industrial value" in chemistry would be relevant to environmental education but confined to the chemical aspects only. The complementary unit, 'utilization of natural resources' in Social Studies, on the other hand would deal with the socio-economic aspects. Either one alone would not cover all the objectives of environmental education on this topic but the two together would meet the requirements. Some countries have adopted a combination of these approaches to suit their particular requirements, e.g.

U.S.S.R - has adopted Approach 1 for students who are completing their secondary education and Approach 2 for the others,

Sri Lanka - has adopted Approach 2 at the junior secondary level and Approach 3 at the senior secondary level.

In addition to the three approaches identified above, a fourth approach, which in the introduction of environmental education through a complete reappraisal and restructuring of the entire school curriculum, is also possible. This undoubtedly is the best but the most difficult approach. However, it has not yet been attempted fully in respect of all subjects in any of the countries in this study, but has been partially attempted in at least two areas, viz science and social studies.

Considering all the approaches mentioned above, one may conclude that even though environmental education has not yet been established as a separate 'discipline' or subject area, it has, in effect, developed into a complex "subsystem" of curricula which are interconnected beyond the boundaries of the conventional subjects.

Some Special Features of Environmental Education Curricula

While the environmental education programmes in most countries conform to a regular pattern, a few countries have special features which are worth mentioning.

Federal Republic of Germany: An interesting development in the FRG has been the institutionalization of environmental education in vocational education and training, which takes places both in the school and in industry.

Colombia: Some Districts have designed special courses on Ecology or Environmental Education as separate subjects. Environmental education is also included in the pre-school curriculum in Colombia.

Venezuela: Activities and content related to the environment are incorporated into the pre-school curriculum under the organizing principle called Integrative Environmental Experience (IEE). Basic Education is divided into six areas and environmental objectives have been defined for each one of them, including the Language Area, Aesthetic Education Area and Training for Work Area.

USSR: A special course has been designed for students completing secondary school known as the "Man and the Biosphere".

4.3 Evaluation

Evaluation of environmental education programmes at school level may be considered under three broad categories:

- evaluation of the curriculum (objectives, content, materials)
- evaluation of strategies and methodologies
- evaluation of the learners

It is clear that the conventional methods and techniques of evaluation adopted at school level are inadequate for environmental programmes because of certain unique characteristics for this subject area, viz

- interdisciplinary nature of its content
- problem-centred approach
- value-oriented nature
- community-oriented strategies
- student-initiated activities and investigations

The usual paper-pencil type of tests normally used for pupil evaluation in the other subjects of the school curriculum and confined mainly to the cognitive domain are totally inadequate to meet the evaluation needs of this complex subject area.

Since the objectives and content of environmental education cover the psycho-motor and affective domains in addition to the usual cognitive domain, suitable instruments and techniques are needed to evaluate the instructional impact on the pupil's learning in terms of their commitment, attitudes, sensitivity, participatory behaviour, problem solving skills, etc. concerning environmental problems and issues. Hence in addition to the conventional written and oral tests, a variety of new evaluation instruments are needed, e.g. observation techniques, awareness tests, rating scales, reaction sheets. In order to cater to such a wide variety of evaluation criteria, a continuous internal evaluation approach needs to be incorporated into the total evaluation system.

With regard to the present state of evaluation in the countries concerned, it has to be stated that very little information is available, probably because such evaluation practices are still in an early stage of development. The available information suggests that since environmental concepts are introduced through other subjects already present in the curriculum, the evaluation of those concepts are also being done along

with the normal evaluation procedures adopted for those subjects

It is therefore reasonable to assume that a major part of the evaluation of environmental education would be conducted under the conventional evaluation practices which are in use for science and social studies. This probably is not a very satisfactory situation in view of the fact that the instruments and techniques used in those subjects may not adequately meet the wider criteria of environmental education.

4.4 Teacher Education

Since environmental education is a relatively new subject in the school curriculum which concerns teachers of many subjects to varying degrees, it has implications for teacher education. At the primary school level, all teachers need the ability to teach environmental studies which form an important component of primary school curricula. At the Secondary level too, environmental education becomes the concern of teachers of all subjects because of the multidisciplinary approach adopted. Science and Social Studies teachers will need it most, but even those teaching languages and the arts would need it perhaps to a lesser extent. Even though this is recognized as an important area in teacher education, relatively little has been done in the development of special teacher education programmes with an environmental focus.

The strategies for introducing environmental education to the teacher education curriculum would be similar to those adopted for the school curriculum. It can be introduced either as a separate course altogether, or a separate subject within the existing courses or can be infused into existing subjects in the teacher education curriculum. A survey of the present situation indicated that only a few countries have attempted to introduce environmental education as a separate course in teacher education. In the present study, only Malaysia and Kenya have so far introduced such courses and that too only on a limited scale and confined to just one institution in each country.

Malaysia: An environmental education course has been introduced in the University of Malaysia, Faculty of Education to train teachers with backgrounds in science or the humanities to teach environmental education. It is offered as an optional course and does not limit itself to graduates of any discipline.

Kenya: The Kenya Science Teachers College has developed a one year course on environmental science for all students enrolled at the College.

Some countries have introduced environmental education as a special subject for primary school teachers (e.g. Sri Lanka). Most countries have adopted the multidisciplinary infusion approach which is the most popular one at the school level too.

Since environmental education was not included in the teacher education curriculum even in a modest way till recently, a large majority of the present generation of teachers in schools need some re-orientation to be able to teach it. Many countries have overcome this problem by organizing in-service training programmes in environmental education for these teachers. Another strategy adopted in some countries is to prepare detailed teachers guides to help teachers in the teaching of the new content. In-service training in environmental education is also provided through Distance Education courses (e.g. Venezuela).

5. SOME PROBLEMS AND ISSUES IN ENVIRONMENTAL EDUCATION

Preliminary analysis of the available material on environmental education in the countries included in the present study indicates that considerable progress has been made in the development of environmental education programmes since the Belgrade and Tbilisi Conferences.

The attempts made for the development of curriculum specifications, teaching and learning materials and for teacher education seem to follow a common pattern with slight variations depending on the characteristics of educational systems in different countries.

The most popular strategy for the incorporation of the environmental dimension into the school and teacher education curriculum has been that of infusing into existing subjects, content related to various aspects of environmental education. A few countries have attempted to introduce special courses in environmental education particularly at the senior secondary level.

Even though elaborate statements of objectives and content which conform to them are to be found in almost all the programmes considered in the survey, some doubts exist regarding the effectiveness of the learning in terms of the broader aims and objectives of environmental education. In the absence of any reliable data on the final outcomes of these programmes, it is not possible to evaluate the effectiveness of the programmes, but considering the teaching-learning styles in formal education prevalent in the countries concerned, it is reasonable to express some concern about the extent to which such programmes have succeeded in achieving the stated aims and objectives.

The difficulties in implementing these programmes with an acceptable degree of effectiveness arises from the special characteristics which make environmental education differ from the traditional school subjects. The teaching methodology in environmental education cannot be restricted to the mere transmission of knowledge: it involves the development of certain

desirable behaviours and attitudes. Even though the objectives stress the importance of such attitudes, values and commitments, there is a danger that these would be lost sight of in view of the importance and priority attached to the examination oriented cognitive aspects in most subject areas of the school curriculum.

Educational research in the past decades have attempted to identify techniques and instruments by which values, attitudes, etc. can be treated in the teaching, learning and evaluation processes. Strategies such as value clarification and value analysis have been tested within the framework of the Social Science Subjects. Various approaches and techniques relevant to and needed in environmental education, such as problem solving methods, simulation and games, etc. have been tried out, but is rather doubtful whether such methods are being used to any appreciable extent in the classrooms in the actual teaching of the environmental content.

A problem which concerns the developing countries is that the concepts and materials on environmental education have been developed mostly in the industrialized countries which make their transfer to other cultural and environmental situations difficult. Since environmental education is to a great extent concerned with the problems of ones own environment, the implantation of a curriculum designed for an industrialized country will not suit the needs of a developing country. Much care has to be exercised in adapting curricula from a completely different environment to suit ones own environment.

Since environmental education is value oriented, teachers and pupils may also come up against contradictory views, policies, and practices regarding environmental matters. Some ideas and values which are valid for industrialized countries may not be valid for developing countries. One may also be confronted with the conflict between accelerated national development and environmental protection in the developing world. All this suggests that much care has to be exercised in dealing with values and

and attitudes in the teaching of environmental education.

An important aspect of environmental education which has not been developed to date is the evaluation of learning and teaching. Evaluation of environmental education is a complex process for which the approaches, methods, techniques and tools conventionally used in general education are quite inadequate. Hence new techniques and instruments are needed. In addition to methods and techniques, certain radical changes are also needed in the traditional attitudes educational institutions have towards evaluation where emphasis is given to individual achievements predominantly in the cognitive domain. Attention needs to be paid to the evaluation of skills, attitudes and values, and activities such as communitiy oriented field projects.

Teacher education programmes are also found to lag behind the curriculum changes in environmental education. The pre-service training in environmental concepts provided for teachers is mostly restricted to a few conventional subjects. The limited experience and insights gained through such an exposure cannot be expected to provide them with the competencies to adopt the expected interdisciplinary approach in teaching environmental concepts at school level. The training also appears to be rather casual and theoretical in nature. The in-service education courses specially designed to meet the actual curricular needs seem to be more effective than the pre-service courses because they can be flexible and free from the contraints which characterize the rigidly institutionalized pre-service training.

Some countries have indicated a dearth of suitable teaching and learning materials in this relatively new subject area and consider the development of such materials as one of the priorities for future action, along with evaluation and teacher education.

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COMPREHENSIVE SCHOOLS IN HAMBURG, GRADES 5 TO 10

Appendix A

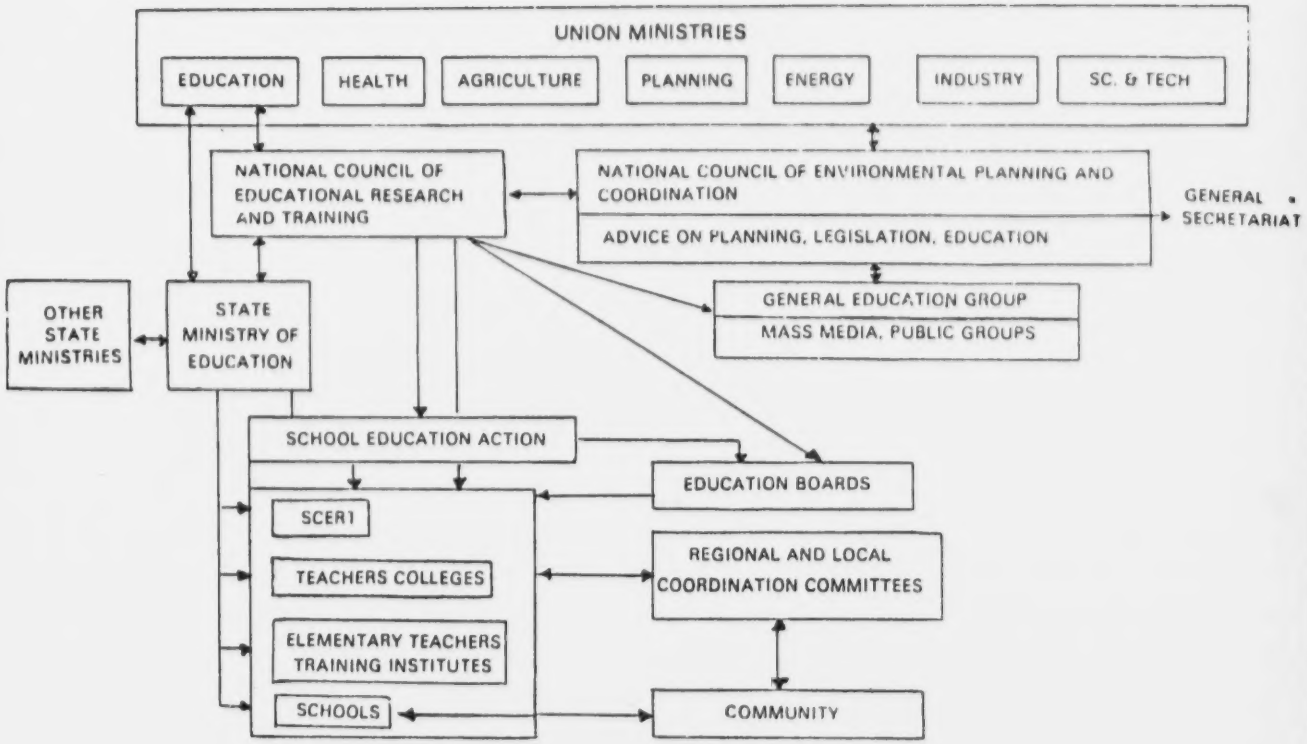
Subject	Grade 5	Grade 6	Grade 7	Grade 8	Grade 9	Grade 10
Biology	Interdependencies between animals and their environment (12 hours) (Biological equilibrium)			Study of interrelationships in an eco-system (15 hours) (Life conditions in an eco-system; additional themes from environmental education) Photo synthesis and the energy and growth cycle (12 hours) Man in his environment (12 hours) (World food problem, industrial society, one crop cultures, pollution, environmental protection and economic growth)		
Chemistry			Oil (9 to 12 hours) (Pollution) The category of fat and soap (6 to 8 hours) (Pollution) Plastics (8 to 10 hours) (Danger of increasing consumption of plastics)			
Physics					Radiation and protection against it (nuclear power plants, environmental protection)	
Industrial Arts (Arbeitslehre)	Packing as an economic and an environmental problem (suggested)		Discussion of economic and social problems of automation (suggested)			
Politics	Means and ways of transportation, developing countries (one crop cultures, population explosion)		Public tasks in the FRG alter-) - environmental na-) protection tively) - transportation in metropolitan areas			Limits to growth
Geography			Urbanization in Latin America (10 to 15 hours) Food problem in India (15 to 20 hours)		Industrial sites and their impact on the environment, FRG (10 to 15 hours) Urban planning and renewal (10 to 15 hours) Weather and climate (10 to 12 hours)	
Nature and Technology			Environment - Water (Importance, degree of pollution and its effects, water cycle, purification, drinking water) Power plants (World energy consumption, water driven power plants, fuel, environmental strain) Plastics (Danger of increasing consumption of plastics)			

Films and Video Cassettes on Topics in Environmental Education

(Catalogue of the Central Institute for Film and Picture in Research and Instruction, 1983)

- The biology of forest pests
- Protection of nature and landscape (biology)
  (60 titles of which 30 are environmental in a narrower sense)
- Chemistry (radioactivity, nuclear power plants, nuclear waste disposal plant, nuclear fusion, crude oil, fats in food, haircare, soap production, process of washing, synthetic materials, cancer-problems)
  (15 titles in total)
- Geography
  (ground water, 3 titles)
  (weather, 8 titles)
  (climate, 8 titles)
  (eco-systems, 18 titles but not so closely linked to environmental protection)
  (evironmental problems, 23 titles, all explicitly ecological)
  (urban structures, 6 titles, closely linked to the environment)
  (environmental planning, 20 titles)
- Physics
  (nuclear physics, 3 titles)
- "Sachunterricht"
  (sewage, 7 titles)
  (noise, 1 title)
  (protection and care of landscape, 28 titles)
  (air, 3 titles)
  (wastage, 7 titles)

  (repetitions in the lists are very likely)



Development and coordination of environmental education at the school level in India : an operational model [13]

Environmental Education Training for Teachers with a Background in Humanities: A Malaysian Experimental Programme

The following is an account of an attempt that is being made at the Faculty of Education, University of Malaysia, to train teachers with backgrounds in science or the humanities to teach environmental education.[24]

The objective of the programme is to develop an interdisciplinary course which does away with the traditional boundaries between the various disciplines.

The course does not seek to teach the basic science concepts and principles, manipulative skills and experimental procedures necessary for environmental scientists and science educators. What is intended is to give to students a clear perspective of the environment, to enable them to understand the fundamental problems of the environment in relation to development and society, what science and scientists can do about the environment and how the sciences, humanities, environment and society interact. The general aim is to discuss selected issues and problems which are not too scientific but which are nevertheless thought-provoking within the context of the various subject in which the teachers have specialized undergraduates. The expectation is that this approach will provide a learning experience which would instil in them and their future pupils an interest in the subject and an ability to keep abreast of environmental issues.

In order to emphasize the interdependence that is emphasized in current approaches to environmental education, the course does not limit itself to the graduates of any discipline. It is offered as an optional course in which students enrol at their choice. The enrolment has had candidates with a wide variety of subject combinations including Geography, History, Economics, Commerce, Malay Literature, English Language, Islamic Studies and Civics. In planning the structure of the course, the following guidelines have been followed:

1. The subject content is carefully selected and presented as a whole to illustrate why an issue cannot be teased into its scientific and humanistic components but has to be viewed in its entirety to understand its full implications (an example of which, the Straits of Malacca, is discussed later);

2. The content is based on a few themes and problems of current interest and the course built around them;

3. An attempt is made to avoid the traditional approach to teaching basic scientific principles;

4. Appropriate methods and techniques are selected to give teacher trainees with no background in Science first-hand experience of environmental issues without going through tedious, conventional laboratory work; and

5. An attempt is made to make the course intellectually stimulating for a group with diverse academic backgrounds.

At the beginning of the course each year, the candidates' knowledge of environmental education is tested in a questionnaire. To the question, "what do you understand by the term environmental education?", responses have varied from vague references to ecology to pollution study, outdoor and field studies, exploitation of nature and even religious understanding of nature and of creation; interestingly, the answers to this question have shown greater increasing attention given to environmental issues by the news media, and the accompanying increase in public interest. To the majority of the participants, the concept of environmental education was not new; what was new was the realization of the need for a methodology for teaching it through their subject specialization.

When asked to name the foundation disciplines that they thought were suitable for environmental education, surprisingly, the subjects most often stated were the Health Sciences, followed by Biology, Geography, Civics and Economics. This clearly indicates the lack of comprehension by the students of the scope and nature of environmental education.

The course is designed for 20 hours of instruction in class (two hours per week for ten weeks) and an additional three hours on weekends for field visits. Lecture and discussion topics are:

1. The organism and its environment - understanding basic ecological principles;

2. Development and the environment - understanding relationships between all aspects of development and its impact on the environment;

3. The nature and scope of environmental education;

4. (a) The need for environmental education
   (b) The genesis of enviornmental consciousness in Malaysia;

5. Identification of environmental problems and selection of themes suitable for use in school;

6. Identification of topics in the various school subjects appropriate for the integration of environmental concepts;

7. The integration technique - approaches to the incorporation of environmental concepts into existing topics;

8. Methodology and approaches to the teaching of environmental education;

9. Resources for the teaching of environmental education; and

10. Laboratory and outdoor activities for environmental education.

The course evaluation is carried out through written assignments and projects. The reports are presented orally to the course participants before being submitted for evaluation. This gives students the opportunity to learn from common experience and to judge suggestions for incorporating environmental education in the various disciplines and the possiblity of teaching it through these disciplines.

The teacher trainees work on their assignments in pairs, to save time in the preparation of audio-visual materials or the conduct of field visits. This practice produces interesting results. It gives them the opportunity to share ideas based on different disciplines and to understand the potential of these different subjects for the teaching of environmental education. This experience is novel in a teacher-training programme because it is rare for students to learn about other subjects and disciplines, let alone collaborate with students in disciplines far removed from their own. It also helps them to comprehend the philosophy of team-teaching, especially in a subject of such an unorthodox nature.

A review of the kind and variety of work done by teacher trainees indicates how the technique of integrating environmentally-related issues through the various humanities subjects can be achieved. These are some of the assignments carried out by students:

1. Development of curriculum materials

For this assignment students were required to work on the syllabus of either their first or second subject. They had to examine the syllabus either by topics or by concepts, and were required to:

(a) Select topics that they felt were most suited to the integration to the integration of environmental education concepts;

(b) Identify and state clearly the concepts, principles and skills that are involved in the topics identified;

(c) Formulate in sequence and knowledge structure the facts, concepts and principles;

(d) Discuss in details how they would plan laboratory activitiy or field experience related to the topic; and

(e) Suggest appropriate audio-visual materials.

This assignment proved to be a favourite among the Geography, Economics, Civics and Commerce students since related topics and environmental indicators are abundant in these subjects, topics such as erosion, agricultural development, deforestation, trade, technology, industry, food, forestry, mining, individual and social rights, population, health and disease, land forms, air, water and soil, weather, natural resources, energy sources.

2. Instructional resources for environmental education

Students were required to choose a topic or problem of current interest and prepare:

(a) An interdisciplinary action-oriented instructional module for primary, secondary or adult education; and

(b) Suggest teaching materials and audio-visual aids.

The students were inclined towards specialized themes such as the proposed atomic research station in Malaysia, water pollution, understanding water, deforestation and conservation. These assignments required a great imagination and involvement with the literature available as well as possible use of field studies to provide practical information.

3. The role of the mass media

The teacher trainees were required to make a list of recent environmental education programmes and campaigns in the country and discuss their objectives, implementation and results. They then discussed in detail how they could use this information in teaching their subjects.

Reporting on the role of the mass media and environmental campaigns proved exciting because it was the first time that it had been done as part of an educational undertaking. Current campaigns on issues such as litter, national parks, forests, ecological sites and histroical sites and monuments were studied. Some students took part in the campaigns themselves.

4. School environment

Having been told that teaching and learning need a healthful environment, students were asked to examine the environments in schools, to report on shortcomings and to suggest improvements.

This involved the trainees in visiting rural and urban schools to study the impact of environmental factors and to draw conclusions about the sort of conditions that ought to prevail in the school environment.

5. Methodologies for environmental education

Taking the environment as a natural resource for learning, students had to choose a particular area and discuss how they would use it to teach specific content in their subject areas.

Schools are often required to conduct visits which can easily become a sort of non-educational picnic outing. In the case being described, no effort was spared to gain work experience. Areas chosen were those easily accessible, such as a quarry, an urban slum, a mangrove swamp, a low-cost housing area, a public beach, and various types of residential areas. Students majoring in language derive special advantage from this assignment in teaching skills such as comprehension, writing and vocabulary.

An Integrated Environmental Education Programme in USSR: Man and the Biosphere

A special school programme in environmental education in the USSR is described in the following article:[23]

For those completing school, an integrated programme "Man and the Biosphere" has been worked out in co-operation with other member states of the Council of Mutual Economic Assistance. Its title accords with the Unesco programme of that name. There are two variations of 35 and 70 course periods respectively. The necessary learning materials have been prepared, and the programme is being introduced at experimental schools. The object of this course is to bring together the various disjointed pieces of ecological knowledge which have been acquired in studying different subjects, and to use this kind of knowledge to help solve national and global environmental problems.

The Soviet version of this programme envisages, apart from theoretical studies: field practice, a seminar, an interview with environmental specialists, a debate, an excursion and a competition and school exhibition of nature conservation problems. Emphasis will be put on development of the ability to evaluate and make decisions. It is expected that the students' sense of civic responsibility will be indicated by their skill at propagating ideas about nature conservation. For this reason, senior pupils will take part in the arrangement of a school exhibition on International Environment Day.

There are two versions of the course: four periods of study a week during the first or the second half of the year, or three periods a week for three-quarters of a year. After one introductory period, students begin to study the first theme "Biosphere Knowledge - the natural science basis for nature conservation" lasting 17 periods. It covers the following problems:

1. The biosphere as a part of the physical world and the state of its development, based on the work of V.I. Vernadski, founder of biosphere studies;
2. The organization of the biosphere;
3. Stability in the biosphere as a result of evolution, and the role of living matter in the creation of life on earth, and

4. The geographical environment and the interaction between society and nature; transition in the management of natural resources; the ionosphere - a new stage in the development of the biosphere.

The second theme "History of the interaction between nature and society" takes up 24 periods of which four are used for an excursion and two for a debate. The main topics covered are:

1. Nature and society, their interaction and the history of their development; scientific and technical revolution, urbanization and perspectives; the beginning of global work on the interaction between nature and society;

2. The decisive role of a social system in the interaction between nature and society;

3. Activity of man as a new factor affecting the environment, the consequences and their evaluation, and

4. Problems of the conservation of nature.

The route of the excursion is chosen to study the effect of man's activities on the natural elements of the locality and the correlations between them. Later, the results of the excursion and material from an interview are used for a debate on one of the local environmental problems.

Twenty-eight periods are allotted for the study of the third theme: "Optimization of the interaction between nature and society (nature conservation)". Three periods are set aside for the seminar, four for a game and eight for practice. The following problems are discussed:

1. Elaboration of the scientific basis for environmental changes and management; limits of stability of the ecosystem and their definiton;

2. The system of nature conservation in the USSR; its legislative basis; the economic basis for rational use of natural resources; State management of nature conservation in the USSR; public organizations involved in nature conservation; and

3. International co-operation in nature conservation; the environmental activity of the United Nations; the role of international non-governmental organizations.

The seminar is on the topic: "Possibilities for the solution of environmental problems in a highly-developed socialist state," and makes use of information from an interview, from newspapers and magazines, and from the students' own essays.

The game is based on an international conference on nature conservation and involves the 'defense of a diploma'. It includes the organization of a school exihibition on various environmental topics.

The introduction of such a course does not mean that the interdisciplinary approach is neglected. The synthesis and generalization of knowledge in the leaving Form, together with periodic junctions of integration of the ecological knowledge acquired in various learning disciplines, would help to create a clearer understanding of the complex environmental problems and develop an ability to solve them. At the same time the basic content of environmental knowledge is acquired through lessions on different subjects.